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Constructors of Horizontal Cross Regenerative By-Product Coke and Gas Ovens,

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CHICAGO, ILL.

THE AMERICAN
GAS LIGHT JOURNAL

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New Standard for Measuring Light.

[Communicated by DR. L. K. HIRSHBERG, M.A., M.D., Johns Hopkins, Baltimore, Md.]

The now well-recognized property possessed by selenium, of changing its electrical resistance when light is flashed upon it, has led to the construction of various devices involving sheets of selenium for the purpose of making exact measurements of light. Nevertheless, selenium remained useless as a photometer because of the inherent peculiarities of the element. Recognizing all of these difficulties, Dr. A. H. Pfund, the young Associate Professor of Physics, Johns Hopkins University, and undoubtedly one of the most persistent investigators in the domain of the physical sciences, undertook a few months ago to bring selenium under the dominion of man. Asked to devise a method of measuring the energy of rays in the spectrum which are beyond the ken of our eyes, to wit, the invisible spectrum by Dr. John Watson, Prof. of Psychology at Johns Hopkins, Dr. Pfund, has emerged from his research completely satisfied.

Selenium is tremendously sensitive to all parts of the visible spectrum, the facts of which are now well-known. If the energy carried by an intense beam of light is to be exactly measured, a little needle, much like a compass arrangement, is deflected from its resting position a certain distance to the right or left. Dr. Pfund has invented such an instrument. The relation between these arrow deflections and the energy has been found to change in a certain manner, as you pass from the *infra* red to the ultra violet part of the spectrum. Dr. Pfund next found an exact law of the relation between the intensity of the flash-of-light and the blocking or hurried velocity as it passed through a sheet of selenium.

Says Dr. Pfund in describing his little marvel: "While there is some effect on exact measurements of light due to other exposures of the selenium plate, if the source of illumination is strong, no such effect was ever found in low intensities of faint lights."

His conclusions are, therefore, that the metal selenium will yield excellent results as a standard of unmixed (monochrome) light is used at the source of illumination, if a standard of sensitiveness in the apparatus is first established, and the exposures to the light, are made by automatic, electrical connections (such as a pendulum) of very short intervals.

He furthermore discovered that selenium, under very faint illumination, is most sensitive toward yellowish-green light, while under intense illumination, selenium is by far the most sensitive toward red light. Great caution is advised by Prof. Pfund, in using selenium as a standard for measuring the strength of white light. Assuming that selenium combines the effects of the different colors, according to its sensitiveness to each, it is clear that the arrow (galvanometer) deflections on the measured scale will not vary according to the strength of the white light, but according to some value determined by an average of the different colors.

The Present Status of Gas Engineering in American Universities, Together with a Few Suggestions for a Specialized Course on the Pacific Coast.

[Lecture delivered by DR. ROBERT SIBLEY, before the Twentieth Convention, Pacific Coast Gas Association.]

The rapid rise of California crude petroleum, and the high cost of all other kinds of crude gas making material, have made peculiarly favorable the manufacture of oil gas in the Pacific Coast cities. This industry has grown up practically during the past 10 years, and has given rise to peculiar problems heretofore unencountered in gas manufacture.

As best setting forth some of these peculiar problems, let us review for a minute the titles of some of the subjects which have been under discussion before this body during the past 5 years. A glance at the "Proceedings" of the Pacific Coast Gas Association shows that naphthaline troubles have not been infrequent, and hence there is embodied much discussion in this organization along this line. "A Knowledge of the Oil Gas Situation from a Gas Man's Viewpoint," and "The Prospects for New Production of Gas Making Oil and the Determination of Water in Crude Petroleum," having been interestingly discussed before this organization, indicate that oil and its uses should play a deep factor in a proposed course in gas engineering. Under the heading of "Manufacture of Oil Gas," papers have appeared on "The History of the Gas Lighting Industry," "The Study of Water and Coal Gas," "The Progress of Oil Gas Manufacture,"

"The Mechanical Handling of the Carbon Product of the Oil Gas Process," "Naphthaline Problems in Oil Gas Manufacture," "The Chemical Control of Oil Gas Manufac ture," "Oil Gas Residual and How to Handle It," "Carbon in Oil Gas Manufacture," "Purification Problems." Such problems as these give a strong indication of lectures and investigations to be covered in a specialized study of gas engineering on the Pacific Coast. On the other hand, distribution problems play deep and significant roles in the oil gas industry. The subjects of the gas meter, naphthaline problems in distribution, gas leakage, gas distribution in big cities, high pressure systems of distribution, and suburban gas distribution, point out the channels to be investigated after the gas is stored in the holder. Upon delivery to the service pipes of the consumer, questions of illumination arise, such as effective gas lighting, effects of high pressure upon illuminating gas, and a proper method of heat measurement for a maximum illuminating efficiency. Modern methods of heating and the introduction of the gas furnace constitute ever-changing problems, and the gas engineer must be ready for their complete solution.

Departing now from the purely technical scale, we find that the well-rounded gas engineer should have a comprehensive knowledge of accounting, leading him to sketch out and formulate campaigns for new business-getting and efficient methods of gas collections after the delivery of the product has been accomplished.

The rapid raise of corporation regulation has indeed placed an additional burden on the gas engineer, and to safely pilot his corporation through the strict rules of regulation he must be familiar with the law, with general methods of appraisal and rate-fixing, and should be ready to define at the proper moment a clear and definite public policy for his corporation. Such a public policy would necessitate general knowledge of fire insurance and fire protection, as applied to gas and electrical business, a general knowledge of legal matters, especially those relating to damage claims that may arise in the prosecution of the industry. Methods of accident prevention and maintaining proper relations with the public should likewise enter into his training. A well-rounded personality in the young gas engineer should be developed so far as possible, thereby making the engineer capable of dealing with municipal affairs and men. In such affairs technical problems of inspection of gas and gas meters under municipal authorities will arise, and troubles with dissatisfied consumers must be met. In fact, as nearly as possible, a training in human nature seems to be necessary.

In casting about for a solution of the problems of the most efficient gas engineering course, I have followed largely the well-known proverb of George Westinghouse, which states that "It is cheaper to buy experience than to manufacture it." With this idea in mind, then, the latest calalogues of some 60 of the leading American universities have been carefully examined, and as nearly as possible all data relating to any phase of gas engineering has been jotted down.

Information from a few of our leading American universities is lacking, but it is believed that a careful perusal of the data herewith appended will give a strong conception of the present status of gas engineering in our American institutions. It is believed, too, that the compiled information representing a widely divorced territory will give general conclusions which otherwise might be considered sectional in character. To supplement this general catalogue data I have corresponded with interested representatives of 5 or 6 of those universities which seem to have devoted considerable attention on gas power engineering and to the manufacture of gas. Among these universities may be mentioned: The University of Michigan, the Massachusetts Institute of Technology, Cornell (N. Y.) University, and the University of Wisconsin. In compiling the information gotten from these sources I have classified the various institutions into four different groups. No fast-and hard lines, however, can be drawn, and only in a general way can this grouping be considered applicable. Group 1 constitutes the American universities which seem at the present time to approach the nearest that of the proposed course in gas engineering for the Pacific Coast. Group 2 includes all universities of America which seem to give a strongly specialized course in Chemical Engineering and in Gas Power Engineering or allied subjects in Mechanical Engineering and Heat Engineering. Group 3 is made up of those universities and colleges which give either Gas Power Engineering or general commercial engineering without special emphasis on gas manufacture. Under group 4 I have included those institutions which merely give such courses as thermodynamics and simple applications in gas power engineering and general industrial chemistry.

Group IV.

Under Group 4, as noted in the data appended in the addendum, may be found the following institutions and a brief description of courses pertinent to the subject under discussion:

The Colorado Agricultural College seems to give but one course in thermodynamics, covering the study of its general principles, and is required in the Mechanical Engineering course.

Washington University (St. Louis, Mo.), maintains a course in industrial and engineering chemistry together with visits to industrial establishments.

At the Iowa State College a study of heat engines, gas engines and producers and gas engine construction and operation, is maintained.

Gas and fuel analyses with a study of boilers and producers is maintained at the Syracuse (N. Y.) University.

The University of Arkansas has two courses: One on gas engines and producers; the second on power plant operation and equipment which deals partly with gas and oil engines.

The University of Iowa maintains two courses: One the study of gas and fuel analyses, the other a course in industrial analyses covering the testing of petroleum and coal tar products as well as other commercial products.

The Montana State College maintains only a course in thermodynamics.

The University of Oregon has a course in industrial chemistry, and another one in commercial engineering, dealing with the systematic study of the appliances used in industrial processes.

The Rose Polytechnic (Terre Haute, Ind.) Institute maintains a course in gas engines.

The Lewis Institute covers in its course elementary thermodynamics, heat engines and analyses of engine materials which includes coal and gas fuel value determinations.

Lehigh (Pa.) University has a course in elementary thermodynamics followed by a study of gas engines.

Group III.

Group 3, as noted above, constitutes a seemingly more specialized group of courses in universities looking toward gas manufacture, although even in this group the actual manufacture of gas is but slightly touched upon.

The Rose Polytechnic Institute has four courses: One on gas for oil engines, another on elementary thermodynamics, a third on heat engines, and a fourth on gas engine design. The laboratory seems well adapted to gas power engineering, but very little attention is paid to gas manufacture.

Leland Stanford, Jr. (Cal.) University maintains courses in industrial chemistry, heat engines and thermodynamics.

The University of California, although considering broadening the work immensely, maintains at the present time but four courses, two in chemical technology, one in thermodynamics and another in heat engines. These courses are, of course, supplemented in the mechanical laboratory.

Purdue (Ind.) University has two courses entitled gas engineering which cover the line of study devoted to the underlying principles of the production and utilization of gas. Gas engine design is also the title of a third course found there.

Ohio State (Columbus) University has six courses, three in industrial chemistry, one in industrial inspection, another on gas engines and producers, and still another on the underlying principles of thermodynamics.

Harvard (Mass.) University has three courses, entitled "Gas Analyses," "Industrial Chemistry," and "Elements of Theromodynamics."

The University of Missouri (Columbia) has three courses, entitled "Industrial Chemistry," "Heat Engines" and "Gas Producers."

The University of Kansas (Lawrence) has likewise four courses, entitled "Chemical Eugineering," "Gas Analyses," "Gas Engine Design" and "Elementary Thermodynamics."

Lafayette (Pa.) College discusses the elements of chemical engines and chemical technology in its department of "Chemistry," and the "Elementary Thermodynamics," and "Gas Engineering" in its mechanical engineering department. The latter course consists of a study of producer gas, water gas and illuminating gas.

The Michigan Agricultural College (East Lansing) devotes a term to gas power engineering, being the study of internal combustion engines and power gas generation, which is preceded by a study of elementary thermodynamics.

The Case School of Applied Science (Cleveland, O.) takes up the

study of elementary thermodynamics, following it by a course on gas engines and testing in the engineering laboratory. There is also a course on the testing and analyses of industrial materials.

GROUP II.

In this group, as noted above, are to be found a number of splendid courses given at some of our American universities on gas power engineering and chemical engineering. In some of them it may be seen that the manfacture of coal gas is considerably dealt with.

The University of Wisconsin (Madison), with its laboratory of technical fuel gas and oil analyses, its lectures on municipal gas manufacture and distribution, together with its lectures on power and fuel gas manufacture and distribution, is closely allied to the ideal we have in mind for our Pacific Coast course. A deep study into thermodynamics and its practical application in gas engineering is prerequisite to the course at this University as may be found in more detail in the addendum.

The University of Illinois (Urbana) seems to have strong features leaning to gas manufacture. Here is found actually a course entitled "Gas Engineering," and under this are discussed such subjects as: Chemistry for engineers, technical gas and fuel analyses, the manufacture of gas, the calorimetry of oils, and the combustion and classification of coal. This work is strongly supplemented from the gas power side in its mechanical engineering department, where we find courses in heat engineering, thermodynamics, power measurements and heat motors.

The Massachusetts Institute of Technology (Boston) likewise presents a strong course closely allied to the subject under discussion. Here a series of courses on the testing of oils, the analyses of gas, heat engineering and internal combustion engines, indicate strongly the leaning toward this direction.

A course in gas power engineering at Cornell (N. Y.) Unsversity likewise indicates specialization. Here we find courses on gas machinery design, gas manufacture and distribution, and gas power machinery.

The Armour (Chicago) Institute of Technology, with its well-equipped laboratories, covers thoroughly the subject of gas power engineering, dealing with gas engines, gas power plants, calorific values of fuels and a thorough course of industrial chemistry.

The Sheffield Scientific School of Yale (Conn.) University maintains strong courses apropos to our subject, among which may be mentioned power plant chemistry, gas calculations, gas analyses, chemistry for engineers, thermodynamics, gas engineering and advanced thermodynamics.

Finally, the University of Nebraska (Lincoln) completes this group, with seven courses dealing with our subjects: Four of which are on engineering chemistry, one on thermodynamics, another in fuel testing laboratory, and still another on gas power engineering.

GROUP I.

From the information that I have been able to gather, I would include but one American University in Group I., which is the University of Ann Arbor, Mich. Even at this University, however, no specific course leading to a degree in gas engineering has ever been announced, although for 10 years past, in connection with their chemical engineering course, considerable attention has been devoted to the subject of gas engineering. In 1901, the Michigan Gas Association endowed a fellowship at this University which allows the occupant, who must be a graduate student, to pursue an additional year at the University in the study of some problem in gas manufacture. This fellowship amounts to $500 per year. During the past year his same Association has established a junior scholarship, amounting to $300 a year, in addition to the former one. It is interesting to follow the splendid work and splendid impetus that the establishment of this gas engineering fellowship has had in promoting interest and research in gas engineering.

Let us, then, devote considerable attention to the fruits of this fellowship at Michigan. The information that I have gotten is by correspondence with Alfred H. White, Professor of Chemical Engineering at the University, and who I understand has had the direction of the gas engineering research work. The dominant motive of the founders in establishing this fellowship at Michigan was evidently a desire to enrich the gas engineering profession, by bringing into it a few chosen men with special training in the profession, with the evident hope that public attention would be called to the desirability of gas engineering as a career, and that thus more men would fit themselves for it. A secondary consideration was undoubtedly that valuable research work might be accomplished.

So significant have the results been of this work in Michigan that during the 11 years not only has the Michigan Gas Association maintained this fellowship, but the scope of the research has been enlarged and advanced until to-day the U. S. Bureau of Mines is undertaking special investigations in conjunction with the research work in Michigan.

Of the first four holders of this fellowship, three were chemists and one a mechanical engineer. During later years, however, the establishment of a chemical engineering course at Michigan has given such an impetus to gas engineering study that all of the students have come from this course. At the start, since no facilities were offered for gas manufacture, the holders of the scholarship, of necessity had to devote their time to the study of the utilization of gas. It is interesting and remarkable, however, to see how well this work was performed. Herman Russell, the first holder of the scholarship, undertook the study of the Welsbach mantle. He showed that, with commercial burners and gas of commercial grade, the illuminating value of a mantle is closely in proportion to its net heating value and almost independent of its candle power. This would substantiate E. C. Jones, of our own Pacific Coast Gas Association, in his contention of last year that candle power as the important standard for gas should be relegated to the scrap heap. The next holder of this fellowship, A. F. Traver, continued the investigations of Mr. Russell. This latter investigator was, by extremely painstaking measurements, able to actually measure the mantle temperature as distinct from the flame temperature, and to show that the mantle was, contrary to the theory then usually held, not nearly so hot as the flame. European investigators have since confirmed Traver's experiments. Traver also showed that an increase in the temperature of the mantle meant an increase in light and so called attention to the matter of designing burners which would give high temperature as the logical step toward increasing the efficiency of the mantle. The third investigator took up the subject of the determination of mantles while burning, and was able to show that the mantles of some manufacturers suffered less in this respect than others did, and hence pointed out the advisability of testing sample mantles, not only after a few hours' use but also several hundred hours continuous burning. At the end of the fourth year, the Michigan Gas Association called attention to the naphthaline troubles that were being experienced among its member companies, and Samuel Ball, the fourth holder of the fellowship, devoted his time to necessary initial experiment for the deep investigations to be followed by later holders of the fellowship. He redetermined the vapor pressure of naphthaline and showed that it was not abnormally affected by water vapor, ammonia, acetylene and other substances as had been previously claimed by other writers. He also developed a method for the determination of naphthaline in crude gas and small quantities of tar, which although somewhat inaccurate still holds for the particular purpose, and by application of this method was able to show that tar was a much more important factor in the elimination of naphthaline than had been supposed.

The next holder of the fellowship continued these investigations by studying at various gas works, paying particular attention to the behavior of naphthalene during the condensation of coal gas. He obtained concordant results, showing that samples of gas drawn from foul main, condensers and tar seperators, contained very small amounts of naphthaline in the free state, almost all of the naphthaline being in solution in the tar fog present. Samples simultaneously taken beyond the ammonia scrubbers frequently showed decided amounts of naphthaline in the free state, almost all of the naphthaline being in solution in the tar fog present. Samples simultaneously taken beyond the ammonia scrubbers frequently showed decided amounts of free naphthaline. These experiments were repeated by this investigator and by his successor, and a complete confirmation of the theory advanced the preceding year was established. Thus it was established that the ammonia, by its solvent action on the phenols of the tar, frequently caused the remaining tar to be saturated with naphthaline. The naphthaline thus liberated was that which later caused troubles in the distributing system.

At the end of the sixth year this work assumed in the eyes of the Michigan Gas Association such importance that it was decided to build an experimental gas plant. As first conceived, this was to consist of minature retort condensing system at the University. This conception, however, soon gave way to the larger one of the installation and purifying plant capable of handling the gas from one of the regular works' retorts to which it could be connected at will. The installation was planned with the advice of expert gas engineers,

and with the hearty co-operation of various manafacturers of equipment for gas works. So important now became the results gotten from this experimental gas works that we find in the ninth year the Technological Branch of the U. S. Geological Survey, now the U. S. Bureau of Mines, began undertaking work in conjunction with the investigators at Ann Arbor. In the tenth year the two-room building was enlarged to four rooms and the equipment increased and improved. Thus it is seen that splendid results have been accomp. lished at Michigan.

Undoubtedly one of the most prominent underlying reasons for the founding of this fellowship is to train men for responsible positions for gas manufacture. Let us for a moment see what these 11 men are doing. Ten have remained in gas engineering work, the eleventh is a consulting engineer. The remarkable prominence obtained by those men is fully set forth in the following professional records:

Herman Russell, B. S. University of Michigan, 1898,
M. S., ditto 1901
Holder of fellowship in gas engineering 1900-01
Inspecting engineer, Detroit Gas Co 1901-02
Assistant Supt., Detroit Gas Co 1902-03
Supt. gas manufacturing, San Francisco Gas and Elec. Co 1903-04
Assistant Engr., Cincinnati Gas and Elec. Co 1904-05
Asst. Supt., gas mfg., Rochester Ry. and Lt. Co 1905-06
Supt. gas mfg., Rochester Ry. and Lt. Co ..... 1906 to date.

Alva F. Traver, B. S. in Mech. Eng., U. of Mich 1900
Holder of fellowship in gas engineering 1901-02
Draftsman, Grand Rapids Gas Lt. Co 1902
Asst. Supt., Grand Rapids Gas Lt. Co 1903-05
Supt. and Eng., Grand Rapids Gas Lt. Co 1905-07
Engineer, Chattanooga Gas Co 1907-09
Supt., gas dept., Denver Gas and Elec. Co 1909-11
Supt., gas and steam heating dept., Denver Gas and Elec. Co ..... 1911 to date.

Max E. Mueller, A. B. U. of Michigan 1903
Holder of fellowship in gas engineering 1902-03
Clerk, Ogden Gas Co., Chicago 1903-04
Chemist, New Amsterdam Gas Co., New York City 1905-06
Asst. Supt., Astoria Lt. and Power Co., Astoria, L.I. 1906-11
[Mr. Mueller put into successful operation the plant for extraction cyanogen at the Astoria works and described the process in a paper before the American Gas Institute, in 1910.]

Samuel Ball, A. B., University of Michigan 1903
Holder of fellowship in gas engineering 1903-04
Student, Jackson Gas Co 1904-05
Supt., La Porte (Ind.) Gas Lt. Co 1905
Asst. Supt., Saginaw City (Mich.) Gas Co 1905-6
Supt., Bay City (Mich.) Gas Co 1906-10
Gen. Supt., Saginaw & Bay City (Mich.) Gas Co ... 1910-11
Mgr. Bay City (Mich.) Gas, Power & St. Ry. Co ...

David H. Clary, B. S. in Chemical Eng. U. of Mich 1904
Holder of fellowship in gas eng. 1904-5 1904-5
Apprentice Jackson Gas Co 1905
Chemist, Western Gas Construction Co 1906-7
Gas expert, Western Gas Construction Co 1907-9
Supt. of Works Minneapolis Gas Light Co 1911
Chemist, Pittsburgh Coal Co., Minneapolis ..... 1911 to date.

Joel M. Barnes, B. S. in Chemical Engr., U. of Mich ... 1905
Holder of fellowship in gas engr 1905-6
Asst. Supt. Saginaw City Gas Co., June to Dec 1906
Production engr. Miller & Franklin Co., Boston ..... Dec. '06 to July '09
Mgr. Miller & Franklin Co., Boston .....
Treasurer Harphone & Barnes Co., production engineers, Boston ..... July '09 to July '10
(Mr. Barnes has been one of the pioneers in production gas engineering. He has devoted himself especially to the textile and paper industries, and has introduced scientific methods in about 20 large companies in New England.)

Frederick E, Park, B. S. chemical engineer U. of Mich. 1906
Holder of fellowship in gas eng 1906-7
Assistant chemist, Detroit City Gas Co 1907-8
Chief chemist, Detroit City Gas Co 1908-10
Supt. Station B ..... 1910 to date.
(Mr. Park developed a method of identifying gas oils by measuring sp. absorption of bromine, which was described in a paper read before the Am. Gas Inst., 1909.

John H. Wyman, B. S. in Chem. Eng., Univ. of Mich. 1907
Holder of fellowship in gas engineering 1907-08
Asst. Supt., Ann Arbor Gas Co 1908-10
Asst. Supt., Kankakee Gas Co. 1910-11
Chemist Grand Radids Gas Co ..... 1911 to date.

Williem A. Dunkley, B. S., in Chem. Eng., Univ. of Mich 1908
Holder of fellowship in gas eng 1908-09
Cadet eng., Lansing Fuel & Gas Co 1909-10
Chemist, C. H. Geist Co., plant headquarters, Atlantic City, N. J. ..... 1010 to date.

Benjamin M. Ferguson, B. S. in Chem. Eng. Purdue Univ 1909
Holder of fellowship in gas eng 1909-10
Assist. Chem. and time study man, Detroit City Gas Co ..... 1910 to date.
(Mr. Ferguson has recently been devoting most of his time to studies in scientific management. He contributed a paper on this subject at the 1911 meeting of the Mich. Gas Association.)

Reuben S. Tour, B. S. in Chem. Eng., Univ. of Mich... 1910
Holder of fellowship in gas eng 1910-11
Asst. to Supt., Consolidated Gas Co., 21st street Station, New York ..... 1911 to date.

From the general outline of work entering the field of gas engineering given at the outset in this paper, it is clearly evident that the young engineer to successfully grapple with them should be prepared to solve all those problems which arise in general engineering practice. At the completion of this general engineering course he should have a working familiarity with organic chemistry, with a special emphasis on coals and crude petroleums. The by-products of coal manufacture with coal tar, ammonia and their handling should be carefully emphasized. The investigation of the breaking-up of crude petroleum under constant temperatures, with special reference to the electric furnace for the treatment of oils under constant temperatures. On the other hand, the mechanical engineering features are strongly requisite for the well-rounded gas engineer. In particular may be mentioned blacksmithing and machine pattern making, together with finished foundry work, strength of materials with emphasis on building design especially in structural concrete work and brickwork. The story of combustion and the losses in distribution and use of all kinds of gas should be mastered. Mechanical drawing, with a knowledge of building design and how to talk with a lead pencil, involving free-hand sketching of mechanical objects and piping, are also imperative.

Bearing, then, these characteristics in mind, it would seem that the ordinary 4-year college course is too little time to give to such a specialized training. The 4-year course at the University of California is organized not only to teach the fundamental principles that underly general engineering, but also to give practical training and such consideration in the economies of engineering as is possible in a technical school. The success of an engineer has come to mean his ability to meet engineers and men of culture on equal terms, and since the work in the regular 4-year course is almost wholly technical, a fifth year is imperative to gain the finishing work necessary in general culture subjects as well as deep investigation in the specialized matter pertaining to the work under discussion.

At the University of California, the following courses are now given in "Mechanical" and "Electrical Engineering." There is also included a suggestion for a possible combination with the chemistry department for such courses as may best prepare students in the department of mechanical engineering for a later specialization in gas engineering.

It is seen from the above (and we may note in passing that this course is practically the same in the first two years in all the engineering colleges at Berkeley) that certain electives are open at the beginning of the sophomore and throughout the junior years. It will be well, then, to fill in these electives by rounding out a knowledge of chemistry. This should consist in thorough courses in quantitative analyses and in organic chemistry.

Taking now into consideration the present status of gas engineering in the American universities—particularly the excellent results of 11

COLLEGE OF MECHANICS. FOUR-YEAR COURSES.—*Matriculation Requirement. Group II.*

I.	Units.		II.	Units.		III.	Units.		IV.	Units.	
Subject A	–	–	Math. 4A-4B	3	3	Mech. 102A-102B	3	3	Mech. Eng. 104A-104B 104C-104D.	3	3
Math. 3A-3B	3	3	Phys. 2C-2D	3	3	or			Mech. Eng. 103A-103B	3	3
Phys. 1A-1B	3	3	Draw. 2A-2B	3	3	Phys. 105A-105B	3	3	Mech. Eng. 105A-105B	3	3
Chem. 1A-1B	3	3	Mech. 1A-1B	3	3	C.E. 8A-8B	3	2			
Chem. 3A-3B	2	2	Mech. Eng. 8A	2	–	Mech. Eng. 106B	2	–	*Mechanical.*		
C.E. 1A-1B-1C-1D	3	3	Mech. Eng. 106A	–	3	Draw. 105	–	2	Draw. 107A-107B	2	2
Phys. Cult. 1A-1B	1	1	Mil. 1A-1B	½	1	Elec. Eng. 110A-110B 110C	2	3	Mech. Eng. 107A-107B-107C-107D	2	2
Hygiene 1	2	–	Mil. 2B	1	–				Elective	3	3
Mil. 1A-1B	½	1				*Mechanical.*			Thesis	2	2
Mil. 2A	1	–	*Mechanical.*			Mech. Eng. 9A-9B	2	2		18	
C.E. 3A (Sum)	(3)		Mech. Eng. 8B	–	2	Math. 110A-110B	2	2	*Electrical.*		
Elective		1	Elective	3	–	Elective	4	4	Elec. Eng. 111A-111B	4	4
	18½	17		18½	18		18	18	Elec. Eng. 111C-111D	3	3
			Electrical.			*Electrical.*			Thesis	2	2
			Mech. Eng. 8B	–	2	Math. 110A-110B	2	2		18	18
			Elective	3	–	Phys. 107A-107B	3	3	*Gas Engineering.*		
				18½	18	Mech. Eng. 9A-9B	2	2	Mech. Eng. 107C-107D	2	2
			Gas Engineering.			Elective	1	1	*Mech. Eng. X	–	3
			Chem. 5A-119	3	2		18	18	**Chemistry X	3	–
				18½	18	*Gas Engineering.*			***Chemistry X_1	3	–
						Mech. Eng. 9A-9B	2	2	****Mech. Eng. 107E	1	1
						Chem. 8A-8B	2	2	Thesis	2	2
						Chem. 8C	–	2		17	17
						Elective	4	2			
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*Mech. Eng. X—Gas Plant Construction. **Chemistry X—Chemistry of Gas Manufacture. ***Chemistry X_1—Physical Chemistry.
****Mech. Eng. 107E—Gas Engineering Laboratory (one afternoon per week—new).

years of experience as brought out in Michigan—and adapting all these ideas to Western conditions and problems, it would seem that the following outline would bring about the best results in preparation for an active life in gas engineering. A student upon entering college should take such a course during his freshman year as would give him a thorough grounding in the elements of mathematical analysis, a comprehensive study of fundamental physics, elementary inorganic chemistry through qualitative analysis, and the elements of plain surveying, with sufficient ground work to give him a comprehensive idea of the laying out of distributing mains and the necessary plotting of typographical features encountered. The sophomore year should continue the grounding in mathematical analysis begun in the freshman year and carry the student through differential and integral calculus. Higher physics should be undertaken in order to clinch the ideas begun in the freshman year, and, in addition, mechanical drawing, followed by descriptive geometry, should be undertaken in order that the student may learn to talk with the lead pencil when future call may come upon him in the design of gas engineering plants. Shopwork, dealing with pattern making, should also be undertaken. In addition to the foregoing work of the sophomore year, quantitative analysis should also be studied in the department of chemistry. In the junior year, having now laid the fundamental basis for technical study, the mathematics of physics, or what is known as engineering mechanics, with its splendid training in mental development, should be taken. The shopwork begun in the sophomore year should now be supplemented with foundry work and machine shop practice, in order that the many intricate problems met with in power plant design may be practically solved, should future occasion present itself. Indeed, a thorough course in machine design should supplement the work in the shop, as should also a thorough grounding in the study of strength of materials and structural design. Organic chemistry should also be undertaken during this period in order that now, having completed the junior year, the student may get his first insight into real, practical gas engineering. At the completion of this year arrangements should be made for those having this thorough groundwork to pursue a summer's work in the gas plant of some of the member companies of this Association. In this work the student should start, if necessary, at shoveling lampblack, and in fact get as near to the actual process of gas manufacture as may be possible. This 3 months' grounding will give him a thorough idea of the gas industry, and unquestionably the beginning of the senior year will find him more serious and sober than ever before in his mental attitude toward his future profession. Having then successfully passed through the summer's work, the senior year at the University should consist of a thorough grounding in thermodynamics, a study of heat engines and gas engines, a study in the chemistry of gas manufacture, and perhaps a thorough course in hydraulics or the flow of liquids, in order that future problems in the flow of gases may from analogy be the easier solved. A thesis during this year should be carefully chosen, in order that he may try out by experiment some of the problems which unquestionably will suggest themselves to him during his summer's work at the gas plant, undertaken as noted above at the completion of his junior year. Having now obtained his degree (B. S.), the engineer in-embryo should enter again some of the plants of the Pacific Coast Gas Association. This time, however, he should be placed for a summer's work in the laboratory and other instructive branches of the gas manufacturing industry, so that when the opening of college arrives in the fall, no doubt longer should remain as to the significance and opportunity of the life work he has before him. Upon his return to college in the fall, he should devote the year to subjects of general culture and to some specialized investigation along his chosen field. As to the subject matter to be undertaken in this specialized investigation, and as to the equipment required, we may now draw forceful conclusions from the experience of the last 11 years at Michigan above enumerated. It has been seen that, in American Universities at the present writing, little attention is paid to specialized coal and water gas manufacture, and none whatsoever to the varying and intricate problems encountered in oil gas productiofl. Indeed, the rapid rise in gas distribution over long distances already presents many problems which hitherto have been solved by rule-of-thumb only, but which in the future, due to research of this sort, may be put upon a more rational basis. The experience at Michigan points indelibly to the conclusion that an experimental gas plant is absolutely necessary, and that this preferably should be located at a near-by commercial installation. The most striking conclusion presented, however, is that the most lasting and interlinking co-operation between the university offering this course and the Gas Association contributing thereto is absolutely imperative. From the fruitful results obtained at Michigan it is seen that the training of competent and successful men to enter the profession follows at once in the footsteps of a gas engineering course. Indeed, not only is the Association blessed with having highly trained specialists enter the industry, but the successful solving of intricate and complicated problems in gas manufacture and distribution is the inevitable result. It would seem, then, that, rather than the endowment of a fellowship as has been undertaken at Michigan, it would be better that the money offered by this Association go toward equipment or toward the employment of a research instructor, to be ever on the alert to point out the path for these research students returning to their graduate year, rather than waste ammunition in offering fellowships, for a sufficient number will enter the work without encouragement of this sort.

During the past year the University has placed three of its graduates from the Mechanical Engineering Department with the gas department of the Pacific Gas and Electric Company. These young men are to-day busily engaged in acquiring the rudiments of the art.

By the placing of these three men experience has already shown that too soon will the field of gas engineering become saturated, unless hearty and wholesome co-operation is extended from every member company of this Gas Association. The rapid rise of unforeseen uses of gas, also, the increasing importance of the internal combustion engine, make the future of gas power engineering exceedingly bright. Hence, in view of a possibility of an over-saturation of gas engineers in the manufacture of gas, we must not lose sight of the fact that the proposed courses in gas engineering should equally prepare the student to enter the wide and promising field of gas power engineering. Thus will be given pliability and elasticity to the opportunities offered in all phases of gas engineering.

The question of a degree to be conferred, if at all, is one of many complications. At the present time no university in America confers the degree known as "Gas Engineer." At the University of California no professional engineering degree is given the student upon graduation from the engineering college, the degree awarded being simply B. S., or Bachelor of Science. Unquestionably the student returning for his fifth year, as outlined above, should upon its successful completion be awarded the degree of Master of Science in accordance with the regulations now in force at the University. As to whether a further degree should be conferred upon the student, after years of practical research and experience, it is difficult to say whether even then the better part of wisdom would say to do it. After all the Biblical quotation "By their fruits shall ye judge them," is the most potent mark in life by which the engineer may be known.

In all of the discussion set forth above it is to be understood that the ideas express are only individual, and in no sense are to be considered of the University Academic Senate or a leaning of sentiment by the faculty, but rather have they been expressed to bring out a thorough and complete discussion in the different points mentioned.

As a final consideration of a gas engineering course or courses, often even more important than considerations of technical and cultural subjects, and even research equipment, is that of environment surrounding the student during his undergraduate days. What nobler mission could a university of the West have than that of fitting men for the solution of western, yes, world-wide, problems in gas engineering; and how well is she prepared by her environment to fulfill this mission? With her beautiful hills to the east, the Golden Gate to the west, California inspires her sons to go ever onward and upward in the realms of scientific thought and research. Between snowy peaks to the north and burning deserts to the south she has distributed with lavish hands opportunities which it is for her sons to develop. The welfare of the State calls for the welfare of her University, and that we should ever seek the welfare of our University is the most lasting lesson that she teaches those of us who have the honor and privilege of calling her our Alma Mater.

In the present day development of California two types of men are present, those who have made their all and have come West to live with us in an ideal atmosphere; and those of the ambitious (but poor) whose motto is to strive and to work.

The noble motive prompting the gigantic effort shown in the collecting of a substantial fund among the member companies of this Association is indeed to be commended in the highest terms. By means of it this insignia "To strive and to work" will be placed one step higher. This Association, already emblazoned in the hearts of men, and known by its own motto throughout the length and breadth of our Coast cities as ever active and alive—indeed as having no "dead ends"—may well be said to be materially aiding in bringing about that time of unhampered individuality in study and research of which Kipling has so forcefully written:

> "And only the Master shall praise us,
> And only the Master shall blame,
> And no one shall work for money,
> And no one shall work for fame;
> But each for the joy of the working,
> And each in his separate star
> Shall paint the thing as he sees it,
> For the God of the things as they are."

[The lecture is closed by a most complete addendum covering 12 pages, which gives in detail the matters concerned with the teaching of students in line with gas engineering practice. The courses and methods explained have to do with the practices of these institutions: University of Michigan; University of Illinois; Sibley College, Cornell University; American Institute of Technology; University of Wisconsin; Rennselaer Polytechnic Institute; Leland Stanford Junior University; University of California; Purdue University; Ohio State University; Harvard University; University of Missouri; University of Kansas; Lafayette College; Michigan Agricultural College; Case School of Applied Sciences.]

Perfect Service.

[Prepared by MR. C. P. HOUGHTON, for the Twentieth Convention, Pacific Coast Gas Association.]

Much has been written during recent years regarding the treatment which should be accorded the public by gas and other public utility corporations, and many very interesting and instructive papers have been presented at association meetings relating to the matter of rates charged, as well as the methods of handling complaints and adjusting the manifold and varied difficulties which arise between the public utility corporation and its consumers. While, in some of our cities, there are gas inspectors whose official duties consist in checking up our service as to the quality of gas, pressure, etc., furnished, and in testing meters upon the complaint of consumers, and while a Board of Railroad Commissioners exercises a certain jurisdiction over our affairs, it has long since been realized by the far-sighted manager that the service rendered by his corporation, and the conduct of its business, must be such that there is no ground for just criticism, either by such commissions or city officials or by its consumers.

Before attempting to render to its consumers that perfect service which is, or should be, the aim of the modern public service corporation, it would be well to contemplate for a moment just what is meant by the term "perfect service," and just what should be the scope of our endeavors to attain that end.

Extension of Distributing System.—The first step toward the rendering of perfect service, in the broad sense of the term, to any prospective consumer of the gas company, will necessarily have to be taken some time in advance of the introduction of the service pipe into his premises. Assuming that the company makes liberal extensions of its street main system with reasonable promptness, upon the application of prospective consumers, it becomes necessary for it to provide for the courteous consideration and proper canvassing of all such applications when the same are received. Should the volume of business be such that the extension cannot properly be made at once, but shows indications of improvement within a reasonable time, the application card should be put aside for a definite period at the expiration of which the proposed run should be recanvassed. In our rapidly growing California cities it is often essential that the gas company anticipate conditions of growth along its prospective mains, so as to meet the reasonable demands of the public for extensions, and at the same time avoid if possible the tearing up of new pavements. Too much attention cannot be paid to the proper repair of street surfaces and pavements, and the replacement of sod over service ditches in lawns, if we are to meet the reasonable demands of city authorities and the public; and where a large amount of street main and service work is done, special attention must be paid to the matter of making such repairs in prompt and careful manner. The Los Angeles Gas and Electric Corporation, in its street main and service department, has in regular operation an oil sprinkling equipment, consisting of a 750-gallon, insulated oil-tank, mounted on a 3-ton motor truck, and also a 7-ton steam road roller (not of the political variety), for use in oiling and rolling filled ditches. When service and meter orders for new installations have been obtained, it will frequently be necessary for the gas company to render some assistance to the consumer in expediting the inspection of the piping, by the city authorities, in order that there may be no delay in setting the meter.

Manufacture and Maintenance of Works.—In the manufacture of gas the importance of maintaining a high standard as to purity, heating value, etc., hardly need be elaborated upon at this time, as many engineering papers relating to oil gas manufacture now form a valuable part of our gas literature.

In the operation and maintenance of our works and holder-stations there is a matter which can be properly referred to in my broad treatment of the subject of perfect service, and this is the duty which we owe the public in maintaining such stations in a shipshape and cleanly manner. A gas works at best can hardly be considered attractive from an aesthetic viewpoint, but it can be made less subject

to criticism, if all buildings are kept in good repair, replacing windows and louvres immediately upon their becoming broken, keeping roofs in perfect repair, stacks painted, and all other steel or brickwork in good condition. With a generating plant having a capacity of over 25 million cubic feet of gas per day, at one location and situated in the city, as is the case with the works of the Los Angeles Gas and Electric Corporation, this will require continued vigilance, and will necessitate small repairs constantly being made to preserve the neat appearance of the plant. We have recently greatly improved the general appearance of our works' stations by enclosing all buildings, facing on or near public streets, with brick or glass and steel-sash walls, by erecting brick walls with iron gates around yards, and by adopting a sightly and uniform type of construction for new buildings. A large holder, recently erected, has been surrounded by a neat brick wall, with large clay urns at the corners for vines or ferns, and ivy has been planted along the footings of the walls.

Distribution.—The distribution of the product is perhaps the most important of all which concern us in connection with the rendering of perfect service. Without entering into any discussion of the different engineering questions involved in the distribution of gas, or of the relative merits of high or low pressure distribution, it must be remembered that, no matter how carefully the system was laid out and constructed, and no matter how adequate the street mains were, at the outset, to supply the demands, the pressures in the different districts must be constantly watched, and all complants of insufficient gas carefully investigated to ascertain if the trouble is due to the mains being overtaxed in any particular locality. If the system is a large one, so that many complaints, usually due to local trouble, are received daily, they should be tabulated by districts and the tabulation submitted each day to the superintendent or manager in charge of distribution. A study of such a record usually discloses any weakness in the system as soon as it develops. This, of course, is not intended to take the place of pressure gauges, which are placed in the different districts to record pressures throughout the 24 hours, but, on the contrary, often suggests a locality which requires checking up by means of a recording pressure gauge.

Meters and regulators, particularly for large installations, should be regularly inspected and tested, and in business districts great care should be exercised in the maintenance of the service and meter installation to guard against fires and other accidents from outside sources.

With large companies, in addition to the regular department for the investigation and adjustment of complaints, an emergency service to take care of gas leaks, fires, etc., is essential. The Los Angeles Gas and Electric Corporation not only maintains a motor wagon, equipped and used exclusively for emergency repairing, extinguishing fires, and as an ambulance for injured employees or others, being fitted with the latest and most approved devices for resuscitating men overcome by gas, or electric shock, but, in addition, employs a 1½-ton motor truck especially adapted and equipped for street main and heavy repair work.

Office Methods.—In the matter of office methods, telephone service, etc., little can be said in addition to what has been written on the subject; but it will not be amiss to mention two or three things which the writer has noted. In a large office, where the number of persons calling daily is very great, there frequently is some confusion and delay in waiting on the public, and to avoid such delays, with the consequent dissatisfaction engendered, we employ an "Information Clerk" whose principal duty is to see that all persons are immediately directed to the proper window or to the investigation department, and are shown seats if it becomes necessary for them to wait for a duplicate bill to be prepared or an account to be looked up. As soon as the necessary information is obtained or the bill is ready, the information clerk notifies them so that they may complete the transaction. Children are looked after by this man, and everything is done to assist the consumer in attending to his or her business with the least possible delay and inconvenience.

Annoyance and ill-feeling are sometimes caused when gas has been shut off on account of the non-payment of bills in cases where a check has been mailed or where a bill has been paid after the order has been sent out to close the meter. To prevent this trouble, and to take care of the closing of meters for the non-payment of bills, we employ a force of "Money or Meter" collectors. These employees are competent meter men, reporting directly to the Chief Collector, and at frequent intervals throughout the day communicate with his department to receive any cancellation of orders to close meters, occasioned by bills having been paid since the orders were issued. This system, together with a night force of office clerks who check the day's collections, segregating the stubs for prompt posting on the morning following, minimizes inconvenience to the consumer who pays his bill at the elevanth hour. Provision is also made for the turning on of gas, under proper restrictions, after office hours at night, where it is claimed that the supply has been discontinued through error, or in case of urgent necessity due to sickness or other cause.

I would emphasize the necessity, for all employees coming in contact with the public, of being polite and attentive to complaints of every description, and of making prompt report of matters which require attention from any other department.

Finally, we must bear in mind that no system, no matter how complete or how carefully devised, will ever enable a company to furnish service which approaches *perfect service* unless such system is consistently carried out, every day in every month, and unless all employees strive to their utmost to further the policy of the Company of rendering such perfect service. I would quote from the lecture delivered by Mr. Geo. B. Cortelyou, President of the Consolidated Gas Company, of New York, at the recent Centenary Celebration: "The shortcomings of a supply as to pressure, candle power efficiency and other essentials, are apt to be the matter of a moment and, when remedied in a gracious manner, leave no rankling; but the shortcomings which are evident in poor service, brought about by inattention, neglect, or slipshod methods, are not so easily effaced from the consumer's mind; so I say that this word *service* should be writ large in the mind of every worker for a public service corporation."

Reasonable Gas Rates and Their Determination.

[Read by Mr. C. L. Cory at the Twentieth Session, Pacific Coast Gas Association.]

There is no more fundamental proposition than that the rates charged by a public utility company must not be greater than the service is worth to the customer, and must not be less than sufficient to yield a fair or reasonable return to such public utility company. It is evident that any standard based on what a service is worth to a customer is in most cases vague and indefinite. The rates paid for the same commodity in other communities is often used, many times to the exclusion of all other factors, as a dependable and equitable guide to be followed in any given case. Again, it is often maintained that in every instance such rates must depend primarily upon the cost to the public utility company of supplying the commodity to every customer desiring such service.

Neither of these two principles can be said to be always applicable or infallible. Thus it is that many factors are involved in the determination of the proper rates for gas service. Viewed both from the standpoint of the consumers and the companies manufacturing and supplying gas, the careful consideration of many complex (in some cases conflicting) elements is absolutely essential for real ultimate economy and mutual advantage to both sides, It is the object of this paper to briefly and, in a general way, discuss some of the more important details involved, to the end primarily that the discussion may indicate the way toward the adoption of, and possibly definitely establish, some principles of ultimate value to the gas industry.

Quality of Service.—While the rates to be charged consumers are of the greatest importance, the quality of the service is of more vital consequence. The supplying of gas in an urban community is more easily accomplished in some respects than the furnishing of electrical energy for light and power. Although the use of gas, like electricity, is confined largely to certain periods of the day, resulting in what are known as peak loods, and also hours of practically no consumption whatever, yet the successful storage of gas in large holders, to be drawn upon as required, eliminates to a considerable extent the necessity of providing a manufacturing plant proportional to the magnitude of the maximum demand, as must be done in most electrical generating stations.

As a result of the adoption of convenient and economical methods of storing gas, the manufacturing plant need be no larger than the average use throughout a 24-hour day which is a manifest advantage. On the contrary, however, the distributing systems, from the gasholders to the many consumers' meters, including the trunk mains, secondary mains, laterals, and services, must be installed of such size as to provide an adequate pressure and quantity of gas to the most remote consumers, especially during the hours of maximum

(*Continued on page* 298.)

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NOTICE TO ADVERTISERS.

New Advertisements and changes of copy therefor should be in hand Wednesday noon of week prior to date of issue.

NEW YORK, MONDAY, NOVEMBER 4, 1912.

[Official Notice.]

Date of Meeting, Indiana Gas Association.

Indiana Gas Association,
Office of Secretary,
Indianapolis, Ind., Oct. 24, 1912.

To the Members, Indiana Gas Association: At a meeting of the Board of Directors, Indiana Gas Association, held in Indianapolis yesterday (October 23d) it was decided that the next Annual Meeting of the Society be held on Wednesday and Thursday, March 12th and 13th, 1913. Place of meeting, Indianapolis.

Philmer Eves, Secretary-Treasurer.

[Official Notice.]

Summary-Tentative Proceedings, December Meeting, National Commercial Gas Association.

We are indebted to the attention of Secretary Stotz, of the National Commercial Gas Association, for this draft of the proceedings that are to be had in connection with the meeting of the Association, in Atlanta, Ga., the week commencing December 2d:

After the usual business incident to the opening of the convention, including the address of welcome, reports of the Board of Directors, President, Treasurer, Secretary, and Committees, election of new officers, etc., the papers to be presented will be as follows, subject to such slight changes as may be found necessary:

Technical.

Tuesday, P.M., Dec. 3d: "Commercialism of Gas Lighting Industry," by Mr. R. F. Pierce, Illuminating Engineer, Welsbach Co., Gloucester, N. J.

Wednesday, A.M., Dec. 4th: "The Education of Employees," by Dr. Lee Galloway, New York University.

"Artificial Gas for House Heating and Its Possibilities," by Mr. A. F. Krippner, Industrial Engineer, Laclede Gas Light Co., St. Louis, Mo.

Thursday, A.M., Dec. 5th: "Efficiency in the Advertising Department," by Mr. E. St. Elmo Lewis, Detroit, Mich.

"Industrial Fuel as a Revenue Producer, and Methods for Development of Large Consumers," by Mr. John S. Welch, of the Industrial Division of the Philadelphia gas works.

Friday, A.M., Dec. 6th: "Gratuitous Work for Consumers: The Reasons, Precautions and Its Remedies," by Mr. E. C. Weisgerber, General Manager, Cedar Rapids (Ia.) Gas Co.

"Sales' Campaigns," by Mr. James P. Hanlan, Public Service Gas Co., Newark, N. J.

Entertainment Features.

Monday evening, Dec. 2d.—Informal reception and buffet supper. To be given by Mr. P. S. Arkwright, of the Atlanta Gas Light Co., at the Piedmont Driving Club.

Wednesday evening, Dec. 4th.—Theater party.

Friday evening, Dec. 6th.—Beefsteak dinner.

Saturday afternoon, Dec. 7th.—Southern barbecue at Cold Springs, following which members will leave for their homes.

BRIEFLY TOLD.

Hail to the Japanese Gas Association.—Mr. T. Takamatsu, President of the Imperial Gas Association, Tokyo, Japan, writing to us under date of September 30th, says: To the Editors, American Gas Light Journal: We have the honor to inform you that the Japanese gas industry has developed with surprising speed, the number of Companies now in operation throughout the country being something over 60. If we include those in course of organization the number exceeds 100. Seeing, therefore, so prosperous and active condition existing in the trade, we have formed amongst ourselves a body known as the Imperial Gas Association, with the purpose and object of promoting an ever-increasing development of the industry, and of giving to the public every benefit and facility that accrue from its proper fostering. Our plan respecting this, being now happily favored by many supporters and advocates, the Association has been put on proper footing. Such being the case, we would be greatly obliged if you would kindly communicate to us, from time to time, any information respecting the general happenings concerning the status of the gas undertakings of your country. We beg herewith to forward you a copy of our new "Magazine," in order that this may encourage you to forward in return a copy of your valued publication, for which we beg to thank you in advance. In this connection we beg leave to inform you that the *Journal* "Gas Kai," that has heretofore been sent to you, was discontinued in publication last month, transferring all business of that publication to our Association.

We greet with all heartiness the formation of the Japanese Gas Association, and wish for its members and its President (Mr. T. Takamatsu) that their body has in it all the elements going to make it an everlasting monument to the ability and progressiveness of an industry that, 10 years ago, unknown to Japan, even now, as to current time and day, involves an investment of millions of yens, which addresses itself so directly to the welfare and comfort of its people, and which will greatly assist the deft Japanese merchants and mechanics, in bettering the quality while decreasing the cost of many scores of the art wares that have made that wonderful country an amazement to present day civilization. In connection with "Gas Kai's" successor we note its front page is occupied by an advertisement of the specialties of that go ahead concern "The Koppers' Company," who we understand are figuring with certain Japanese concerns for the introduction in that country of several specimens of gas making, residuals recovery plants.

CURRENT MENTION—

The *Evening Standard*, of Ogden, Utah, in its issue for the 21st ult., announces that Mr. C. A. Boyd, "representing Eastern financial interests," has made application to the City Commissioners "for a franchise," to live 50 years. Mr. Boyd declares that his principals, immediately on the issuance of the grant, will commence active work on construction account, as "an initial to a finish" of $250,000 to $350,000 on a gas plant that will be up to supplying gas to Ogden's residents in "less than 2 years." The gas rate is to be $1 per 1,000, there will be no meter deposits required, and the minimum monthly service stipulation shall not exceed 50 cents. All of which is respectfully submitted.

An agreement has been reached between the proprietors of the Charleston (S. C.) Consolidated Gas Company and the authorities of that city under which the net selling rates for gas and electricity have been adjusted to the following: Gas, $1.10 per 1,000 cubic feet; electric current, 10 cents, per measurement usually accepted.

The Kentucky Public Service Company, of Frankfort, Ky., has announced the arrival of Mr. A. Jay Short. He succeeds Mr. F. Austin as local Manager. Mr. Austin has been appointed General Auditor of the Kentucky Public Service Company, which operates

in Frankfort, Owensboro, Hopkinsville and Bowling Green, Ky., and Clarksville, Tenn. His headquarters will be Hopkinsville.

MR. VERNE M. CUTTER, formerly Superintendent of the Chicago Heights Gas Company (he first assumed that charge in 1906), succeeds Mr. W. F. Booth as General Manager. Mr. Booth goes to Little Rock, Ark., where he is to act as Manager of the Pulaski Gas Company.

THE Sprague Meter Company, of Bridgeport, Conn., has shipped for export, within the past 60 days, 4,275 meters, the major number of which went to points in Australia and South America.

"M.," writing from Concord, N. H., under date of the 31st ult., says: Dear JOURNAL: The first meeting of the Gas Club, of the Concord (N. H.) Light and Power Company, was held the evening of October 30th. The feature of the evening was a very interesting "talk" by Mr. Charles E. Blood, of the General Gas Light Company, of New York and Kalamazoo, on the relation of the employee to his company. We knew "Blood" was some salesman, but we know now that he can spout (and to the point) to some real purpose. This was followed by an illustrated lecture (150 slides were shown), the pictures well portraying installations of public lighting in various sections of the country. It was altogether a most enjoyable evening, and, further, was sufficiently instructive to cause both Company and men to assert that the Club cannot fail to be of advantage to both. A vote of thanks was tendered to Mr. Blood, after which a very appetizing supper was served.

A NEW venture in the field of gas journalism is recorded. Its name is "The Gas Record;" its putative owner is "The Gas Publishing Company;" its personality is "Nil;" its headquarters are to be in Monadnock Block, Chicago; it is to be printed on the 10th and 25th days of each month, save when these dates fall on Sundays—in which event it will appear the following days—the 11th or 16th, respectively. The price is to be $2 per year, which certainly is a modest one, especially in view of the fact that it is going to "Have correspondents and contributors in all parts of the world, keeping its readers in touch with the latest developments of interest and value from a gas man's point of view." Knowing what it costs to secure articles of interest in our line, which knowledge was acquired in the space of 42 years, more or less of a pretty quick passage, we fail to see how long a bankroll can last, even in the last up-to-date gas publication, that is based on a $2 year receipt from each of 2,000 subscribers! However, we wish its publishers "good luck," especially in view of the fact that, unrevealed as they stand at this writing, they are not of the nervous sort. Again, we exclaim, "Good luck to them!"

AT the October meeting of the Joseph Dixon Crucible Company these changes in the executive occurred, the substitutions being necessary through the lamentable loss by death of its Vice-President, Mr. Wm. H. Corbin: Mr. George E. Long, formerly Treasurer, was elected Vice-President, succeeding Mr. Corbin. Mr. J. H. Schemerhorn, former Assistant Treasurer, was named to a seat on the Board and to succession in the Treasurship; and Mr. Albert Norris was elected Assistant Secretary and Treasurer.

WRITE to the American Engineering Company, Philadelphia, for a copy of the recent pamphlet on the matter of the "Taylor Stoker." Perhaps it would secure a speedier reply were the inquiries addressed to Mr. E. G. Marble, the Company's Sales' Manager.

PRESIDENT H. W. HUNTER, of the Baltimore Gas Appliance and Manufacturing Company, under date of October 31st, informs us that Mr. William A. Richards will represent the Company in Eastern territory.

THE latest move by that up-to-date concern known as the Mueller Manufacturing Company, whose magnificent main shops are the largest part and parcel of the wideawake town of Decatur, Ills., and whose goods are known all over the world, has finally completed arrangements for the establishing of a factory in Sarnia, Canada. Sarnia is on the Canada side of the St. Clair river, at a point opposite Port Huron, Mich. It is inland, say 2 miles, from Lake Huron, and only 60 miles from Detroit. The Company secured a tract embracing 72 acres, on a section of which stands some structures which were formerly housings for the men and machinery employed in the operations of the Standard Chain Works, Pittsburgh, Pa. Here the Mueller folks will erect structures suitable for the production of its standard specialties for gas and water works men. To properly carry on the branch the Mueller Manufacturing Company, Limited, has been formed, the officers of which are: President and General Manager, Oscar B. Mueller; Vice-President and Superintendent, C. G. Helby; Treasurer, Adolph Mueller; Secretary, Asst. Treas., and Asst. General Manager, Fred. L. Riggin. Mr. Oscar B. Mueller, it will be seen, is the official keynote in the new business structure, but New York is not to lose him altogether, for he proposes to retain charge of the Mueller Company's New York branch, an addition to the Company's vast interests that, through O. B.'s careful and masterful management, has far more than justified its formation and organization only a few years ago. We will, though, lose that prince of shipping clerks (C. W. Padgitt), who has been named to go from New York to Sarnia, there to assume direction of the Canada concern's stock and shipping departments. That the venture is not a venture (paradoxical as that may seem) may not be truthfully denied, for the Mueller Company's business relations with Canada have for years been on an increasingly expanding scale; but that certainly need not preclude us from wishing them the best of good luck over their Sarnia development. Meanwhile some of our high-tariff upholders might possibly see in this act a reflection not pleasing to their vision. For instance, if our relations with the great country within the Dominion of Canada were of the right sort, movements of the nature here shown would not be necessary. That is, instead of giving altogether to Canada, in the shape of investment in structures, transportation charges in part, payments in salaries, wages, and the like, all of these investments would have continued in the States in general, and to Decatur in particular. However, these are matters for our politicians to consider eventually, no matter how much we or others may refer to them initially.

BOOK REVIEWS.

"*Hole's Distribution of Gas.*"—The third edition of the most comprehensive book available on "Distribution", by Mr. Walter Hole, engineer, lecturer and examiner, Leeds, England, is published by Messrs. John Allan & Company, London, and is for sale by the AMERICAN GAS LIGHT JOURNAL. Price, $7.50. The most important additions to the third editon of this now standard work on distribution cover the subject of "High Pressure," which is without doubt the most important development in distribution in the last decade. The additional chapters include the transportation of gas under pressure, and its use for lighting, heating and industrial processes. The present volume contains 837 pages, including no less than 687 cuts, and these are most essential to the text, as the work covers the apparatus and appliances required for carrying the product and its utilization under a wide variety of conditions, both indoors and out. To say that this volume should be in the hands of every gas engineer, and that it should be available for reference by every student of gas supply, would not be overpraising it.

Publications.

[All Publications, Catalogues, etc., mentioned below, are kept in our office for the convenience of our patrons.]

"*Heat Controller.*"—The Machlet Automatic Heat Controller, for use in connection with industrial appliances, is well described in a pamphlet issued by the American Gas Furnace Company, of this city.

"*Range Specifications.*"—The Committee on "Standardization of Gas Appliance Specifications," N. C. G. A., has issued its proposed gas range specifications in pamphlet form. It is hoped that this report will receive due consideration from all interested before being presented for adoption at Atlanta. Copies can be obtained by addressing Mr. Louis Stotz, Secretary, National Commercial Gas Association, 29 West 39th street, New York City.

"*Light: Its Use and Misuse.*"—Again, we are led to note that in connection with this pamphlet the Illuminating Engineering Society has issued an exceedingly attractive scale of prices on its "Illumination Primer," ranging from 10 cents for single copies to 1.5 cents in lots of 500,000. These could be distributed to good advantage by gas companies to both the public and their employees. Samples and full particulars may be obtained by writing to Secretary P. S. Millar, 31 West 39th street, New York.

"*Advertising Novelty.*"—The Boston Consolidated Gas Company is distributing a combination advertising card, blotter and return post card, which would bear inspection by the "ad." man. Write for a sample.

"*Coking of Coal.*"—Bulletin No. 60, University of Illinois, is an essay by Messrs. S. W. Parr and H. L. Olin, covering the results of one of the numerous investigations being conducted at the Engineering Experiment Station, Urbana, Ills.

(*Continued from page* 295.)

demand. There is a direct similarity then in this regard in the distribution systems for both gas and electric service.

Gas distribution systems in general, however, cost more per consumer, or perhaps, to put it in a better way, more per dollar per month paid by consumers, than electrical distribution systems, especially in comparison with overhead pole line construction in electrical distribution. The gas distribution systems are of a more permanent character, and should be less often changed or enlarged. The ultimate result is usually then that investments are made in gas distribution systems in advance or ahead of the immediate probable use of such systems, so that the reconstruction, enlargement and reinforcing of mains, necessitating the tearing np of pavements and continual excavation of streets, are the less often required. But no matter how old or limited in capacity a gas distribution system may be, it is of vital importance that all customers may be adequately served with gas at the proper pressure when the demand is greatest and to meet this requirement, it in some cases, may be desirable to install an automatic pressure regulator for each individual customer. While the cost of such regulators is considerable, approximately $4 or $5 each, installed, the improvement in the service is very marked and inevitably results in a material reduction in expenditures for trouble men, as well as other costs of correcting the troubles of customers caused by a considerable variation of pressure at the gas consuming devices.

Uniform chemical composition and thermal value in the gas supplied are also essentials of good service. Impurities, especially sulphur, are very disadvantageous to customers, often resulting in the very rapid deterioration and expensive replacement of gas consuming devices and auxiliaries.

Further consideration of what is proper service will not be attempted, except to emphasize most forcibly that good service is absolutely necessary. Anything less than the best reasonable service is a most serious matter to be corrected by the co-operation of the rate regulating body, if any, the customers, and the gas company at the earliest possible moment. Continued poor, inadequate, or unsatisfactory service to even a relatively small number of customers is intolerable and cannot but ultimately result disastrously to the company as well as its customers.

Almost any user of gas can, and probably under the pressure of threats to cut off the gas (and no possible chance to get the desired service from another company) will pay even exorbitantly large or unreasonable gas bills, but even with a flat rate of a few cents per month, poor service with impure gas of insufficient pressure when most needed, probably for cooking breakfast or dinner, and no possible relief from a competing company, is an abomination, and is not only wrong in principle, but is directly contrary to true constructure ideals, is in direct violation of the eleventh commandment of Holy Writ and may be urged in the future life of the unhappy and tormented spirit of the abused gas user as a reason for his or her condemnation to eternal punishment; and I leave to your imagination the excuses that the responsible officials and owners of gas companies will, with parched throats and pleading and halting voices, utter while they too are struggling vainly to escape from the bottomless pit of Hades, there to be tortured for all future time with the most unheard of, preposterous and unjust complaints of payless customers, constantly reduced rates, and increasing deficits, while submerged to their necks in sticky lampblack and in a sulphurous atmosphere of a temperature and humidity, such that the heat of the firebrick checkerwork in the interior of an oil gas generator when operating at full capacity would seem to be the absolute zero, minus 473° C., when compared therewith.

Mutual Responsibility of Gas Manufacturer and User.—The obligation of the gas company, then, to give good, adequate and proper service is established, providing, however, that this obligation is in reality of a mutual character, in which those controlling the rates and service, as well as the customers, accept, and continue, without repeated lapses into political intrigue, to do their honest share in the carrying out of what is, after all, a mutual contract.

In my paper last year reference was made to this important phase of the situation; but it may be well to here briefly mention some other considerations most directly relating to the determination of gas rates. How can a company, individual, or any kind of an organization, properly and satisfactorily furnish any kind of public utility service, constantly extending their systems and increasing their investments coincident with the rapid increase of population, if no protection is given them from what are really destructive "shoe string" competitors, or even competitors of the most powerful but piratical character.

Among the public utility service corporations, the gas company stands among the foremost as a desirable natural monopoly in any given district, and for the reason that is often not appreciated by many people, namely, to protect the public and upbuild the commonwealth. The absurdity of having duplicate gas distributing systems, belonging to different separately operated companies, may be inferred from what has been said above. From what will be shown later in actual figures, the fixed charges, independent of the amount of gas made or sold, represents a much larger portion of the cost of properly serving customers than will be found to exist in the conduct of the business of many other public service companies. The wide variations in gas rates in the different cities on the Pacific Coast show this conclusively. The quantity of gas made and sold from a single manufacturing plant is certainly one of the most important factors in determining gas rates.

It is a fact, which cannot possibly be controverted, that the cheapest possible gas rates may be perpetually maintained to the ultimate benefit of all parties concerned and with the greatest economy for all time, when the largest number of gas consumers are served from a single operating system, especially for distribution in any geographical district. And it is also true that the larger the district served from a single manufacturing plant, as long as the average density of population using gas does not become too low, other conditions being the same, the lower may the gas rate be made and maintained continuously to the mutual advantage of both manufacturer and user.

Is it not inevitable that the false economy of dividing the total gas sales in a given district between two or more separate manufacturing and distributing companies is and always will be a burden that will be borne largely by the commonwealth, and tend toward the financial embarassment of all, including gas companies and their consumers?

It must not be forgotten in connection with the above argument against unrestricted competition that it is assumed an able commission or other regulating body, wisely and with full knowledge based upon careful investigation, has complete control of the regulation of rates and quality of service of the one monopolistic gas company.

The so-called regulation of rates and service directly by inexperienced though well-intentioned municipal or county officials elected by the people, often for no other reason than their political affiliation or delightful or otherwise personal qualities, without any real understanding of the facts, is as absurd on the face of it as to entrust to the generous proportioned Indian squaw of the Arizona desert the judging of the modishness and beautiful blending of delicate colors of the creations so dear to the civilized feminine heart on, exhibition, to the destruction of the masculine pocketbook, at our spring and fall fashion shows, or to leave to the untutored and lazy Apache, whose epicurean tastes are limited to Indian corn and tulapi, the planning of the banquet for this evening. No decree or judgment can endure and be constructive rather than destructive in its effects upon humanity unless the judge, in rendering such decision, combines knowledge, experience, wisdom and justice.

Rates of Return and Value.—It is self-evident and repeatedly expounded that, in the determination of reasonable rates of service, both the reasonable rate of return, including interest and profit and a fair valuation of the property used and useful in the service of the public, must be established. As indicating some of the elements entering into the determination of what is a reasonable rate of return, reference is here made to the report in 1911 of the Railroad Securities Commission, of which President Hadley (Yale University), was Chairman. What is said there regarding the railroads of the country applies equally to all public utility enterprises.

"We hear much about a reasonable return on capital. A reasonable return is one which, under honest accounting and responsible management, will attract the amount of investor's money needed for the development of our railroad facilities. More than this is an unnecessary public burden. Less than this means a check to railroad construction and to the development of traffic. In no event can we expect railroads to be developed merely to pay their owners such a return as they could have obtained by the purchase of investment securities which do not involve the hazards of construction or risks of operation.

"Your Commission recommends that the Interstate Commerce Commission should have authority and adequate funds to make a valuation of the physical property of railroads wherever the question of the present value of these roads is of sufficient importance. It is hardly necessary to add that your Commission does not believe that the cost of reproduction of the physical properties however carefully computed, is the sole element to be considered in determining the

present value of a railroad, or that the outstanding securities could or should be made to conform to any such arbitrary standard.

"It is quite possible that the building of additional railroad mileage will be far less rapid in the future than it has been in the past, but the capital needed for the development and the improvement of the mileage already existing is enormous, even if we built no new mileage at all. Neither the rate of return actually raised on the par value of American railroad bonds and stocks to-day, nor the security which can be offered in the future, will make it easy to raise the needed amount of capital."

Although you are familiar with the decision of Justice Peckham (United States Supreme Court), in the case of the Consolidated Gas Company, of New York, reference is also here made to the following extract from this decision, as having unquestionably the most direct application to the rate of return for gas companies in large cities, although the question in this case was not the determination of the reasonable rate of return, but rather whether or not a certain rate of return would be enough to avoid the charge of confiscation.

"There is no particular rate of compensation which must in all cases and in all parts of the country be regarded as sufficient for capital invested in business enterprises. Such compensation must depend greatly upon circumstances and locality; among other things, the amount of risk in the business is a most important factor, as well as the locality where the business is conducted and the rate expected and usually realized there upon investments of a somewhat similar nature with regard to the risk attending them. There may be other matters which in some cases might also be properly taken into account in determining the rate which an investor might properly expect or hope to receive, and which he would be entitled to, without legislative interference. The less risk, the less right to any unusual returns upon the investments. One who invests his money in a business of a somewhat hazardous character is very properly held to have the right to a larger return, without legislative interference, than can be obtained from an investment in government bonds or other perfectly safe security. The man that invested in gas stock in 1823 had a right to look for and obtain, if possible, a much greater rate upon his investment than he who invested in such property in the city of New York years after the risk and danger involved had been entirely eliminated.

"In an investment in a gas company, such as complainant's, the risk is reduced to almost a minimum. It is a corporation which, in fact, as the court below remarks, monopolizes the gas services of the largest city in America, and is secure against competition under the circumstances in which it is placed, because it is a proposition almost unthinkable that New York would, for purposes of making competition, permit the streets of the city to be again torn up in order to allow the mains of another company to be laid all through them to supply gas which the present company can adequately supply. And, so far as it is given us to look into the future, it seems as certain as anything of such a nature can be, that the demand for gas will increase, and, at the reduced price, increase to a considerable extent. An interest in such a business is as near a safe and secure investment as can be imagined with regard to any private manufacturing business, although it is recognized, at the same time, that there is a possible element of risk, even in such a business. The court below regarded it as the most favorably situated gas business in America, and added that all gas business is inherently subject to many of the vicissitudes of manufacturing."

It may be of value to indicate some of the factors entering into the determination of a fair return upon capital invested in public utility companies, and also to enumerate specifically some of the risks to which the investment in many public utilities are constantly subject. The return upon the investment required by a public utility corporation is itself the sum of four elements, the first three pertaining to what is generally known as interest, the fourth as profit, as follows:

(1) Rental on money thoroughly well secured.
(2) Insurance to cover risk of loss.
(3) General expense involved in obtaining money and providing for periods of idleness when such money is not invested.
(4) The return to the owners of the property for their proprietary supervision and initiative actions, which return is true profit.

In any given community the rate of interest varies mainly because of variations in items 2 and 3. If money absolutely secured against loss commands 5 per cent. item 1 is 5 per cent. If the insurance risk is 1 per cent. and if the cost of obtaining the money is 1 per cent., the total interest rate is 7 per cent. The further a property is from the large money markets, the larger do items 2 and 3 become. Hence mere interest rates on the Pacific Coast are considerably higher than in the East.

The item of risk (2) rises as the amount loaned becomes a higher percentage of the value of the security. If the money can be borrowed at 7 per cent. on a loan that is, say, three-fourths the market value of the property, there is a margin of security in the remaining fourth that has operated to reduce the item of risk (2); if, however, it is desired to borrow money up to the full market value of the property, 8 per cent. or more may be the interest rate, for item 2 has necessarily become greater. It will be noted that nearly every loaner of capital assumes some risk and charges interest rates accordingly. The borrower who uses the capital assumes the risk of being able to earn a profit, but his risk is provided for in the percentage of gross earning that it is estimated he should earn.

It has sometimes been asserted that there is practically no risk either on the part of the loaner of capital or on the part of the owner who uses the capital to build and operate a public utility. However, there are few utilities that are operated without risk. Thirty-odd years ago gas lighting companies seemed to be safe against losses, but electric lighting has been developed to such a degree that many gas companies are not earning bare interest rates on the cost of their property. There is, in fact, no plant on earth that is safe from possible loss of earning power, so long as inventive genius exists and continues active, for a new invention may, at any moment, change completely an entire industry. A public utility in a small town or city is subject to many risks, some of which it may be well to enumerate:

(1) Competition from other utilities, whether privately or publicly owned.
(2) Stagnation in the growth of the town or city, causing loss of return on a plant built to provide for, and assist in, effecting growth.
(3) The passage of laws and ordinances injurious to existing business.
(4) Financial panics that deprive people of the means with which to pay for ordinary utility service.
(5) Great fires, floods, tornadoes, earthquakes, strikes, war, and other causes beyond the control of the utility company.
(6) Regrading of streets, extensive paving and other public expenditures, the burden of which a utility company must share either through direct assessment or through taxation.

These and other causes often make the risks of a utility company very considerable. The smaller the city or community, the greater the risk. Even when a public service commission fixes a rate of "fair return" the risk is not eliminated, for it may not be feasible to secure a fair return. In recognition of all these things, the tendency of public service commissions and of courts has been towards allowing higher rates of return than were at first regarded as sufficient for a public utility to earn.

Judicial and commission decisions, consistently and repeatedly rendered, have established the soundness of the principle, and the necessity, that the "value" of any enterprise of any character must include, in addition to the physical property actually used and useful in rendering service, the "going value" or the "value of the going concern." Such intangible value, over and above the physical value, may be referred to by a number of different names, but in every case it is to be considered as the difference between the value of a physically complete and practically perfect plant or system ready for operation but not in operation, ready to give service but not giving service, ready to earn an income, but actually earning no income whatsoever, ready to enter into long or short term contracts with customers or consumers, but actually having no contracts of any kind with any consumers, at the end of the construction period, but as yet with no business at all, and the value of this plant at some later time when business has been developed and perhaps firmly and permanently established, with many contracts, some for long terms and of greater or less value, with customers connected and receiving and paying for service, possibly in a progressive territory where the enterprise in question has in the past assisted, and is at present assisting materially in the general advancement of the community.

Viewed from a different standpoint, it may be supposed that the owners of such an enterprise are willing but are not compelled to sell, and a prospective purchaser is desirous, but not forced to buy the plant, system and business. Then the amount which such a prospective purchaser would pay the owners, over and above the value of the physical property only, is unquestionably the going value of the enterprise. While the above statement must unquestionably be accepted as having been actually confirmed in numerous transactions, it is difficult in most instances to establish sound principles which may, with confidence and fairness, be used to determine in definite figures the going value of an enterprise, and particularly of a public service corporation under the control of any public rate fixing (and quality of service) commission.

One element of going value which is quite generally accepted is the "Cost of Developing Business," or the "Development Expense," and if the aggregate of the various items, which are properly a part of the development expense, is not inconsistent with the value of the business actually obtained and held by the company, then the going value and development expense have a close relation in actual figures

one with the other. But it must be remembered that "cost" and "value" are not necessarily equal. "Cost" may be greater than "value" under disadvantageous conditions, while "value" may be, and often is, many times the "cost" under decidedly favorable conditions. But if sufficient data and records are available in any given case, so that the development expense can be reasonably accurately obtained, and the management has been to a large degree wise and economical and good judgment has been shown, there is probably no more accurate or fair method available to obtain the "going value" than its determination from the actual cost of building up and establishing the business. The items which properly should be included in the development expenses are:

1. The difference if any between a "fair return" on the "value" of the property during the first years of its existence, or during the development period, and the actual return, tabulated by years and until such time as it may be said that the business is established to such a degree as to be earning a fair return on the investment, including the interest which the business has failed to earn, taking each year by itself.
2. All actual costs directly related to the securing of business, such as advertising, soliciting, unremunerative concessions to prospective customers, such as gifts, selling accessories below cost, maintenance of amusement parks to increase business, providing, of course, such costs are bona fide expenses over and above the direct revenne which may be obtained therefrom.
3. The cost of developing a competent business organization for the purpose of developing business, but this cost must not be included in the general annual cost of maintenance and operation.
4. All the expense in the past history of the company, which has been necessary and unavoidable in modifying the character of the system as a result of rapid changes in the art or abnormal growth of demand for service, and which were required for the most economical operation and growth of the business, unless all such expense has been previously taken care of by an annual allowonce for depreciation, obsolescence and inadequacy, resulting from such modifications of the system.

Where a public utility enterprise has a number of departments, such as electric light and power, gas and electric railway service, it would seem best in computing the development expense to consider each department separately from the time service was first given in each department, but in applying the final aggregate of all departments, if there should be a surplus in one or more departments, such surplus might be very properly considered as offsetting or tending to balance the inadequate return in one or more of the other departments.

. In my opinion the statement that past "deficits" in the operation of the business should be combined and used as a measure of the "going value" is not only unfortunate but decidedly misleading. Interest during the construction period might quite as properly be termed a "deficit" in return on the investment during the construction period, because the money expended during the construction period does not earn ordinary rates of interest during the construction period.

During the development of business period, the difference between a fair return and the actual return cannot properly be called a "deficit," but represents in reality an additional sum which investors should be prepared to put into the enterprise, over and above the cost of the physical plant, and continue to do so until the system is firmly established and consists of two main parts—the physical plant and the business actually being done at a real profit over and above legitimate maintenance and operating costs.

The word "deficit," while undoubtedly it should not be so interpreted, is unquestionably many times understood as implying uneconomical and unwise management, or the lack of reasonable foresight and good judgment, both of which qualities should be possessed to a considerable degree by those in control of all public utilities upon which the people are compelled to depend for proper and reasonable service at rates as low as are consistent with the existing conditions. It is, therefore, in some instances preferable to avoid the use of the word "deficit" in connection with "development expense," and obtain the going value by assuming that all expenditures in developing the business, up to the time that a fair return is earned on the investment, should be added to the physical value of the system in order to arrive at the total value of the entire system in successful operation as a going concern, giving satisfactory service to its customers. Necessary expenditures to deyelop business bear identically the same relation to the development period as interest during construction bears to the construction period.

Practical Illustration in the Determination of Gas Rates.—In order to illustrate definitely some of the factors that should be given consideration in the determination of the rates for gas service, I have compiled some data and figures upon a gas plant and system which I will say frankly have no physical existence so far as I know. In other words, while the figures are, I am sure, quite representative of many small gas plants and systems on the Pacific Coast, yet the figures given do not apply exactly to any particular installation.

I can assure you, however, that in general the data of those who have had experience with such gas service installations may be like the old farmer who was, with wonderment and awe, seeing a circus for the first time in his life. In the menagerie tent he caught sight of a dromedary. He looked at it a long, long time and finally observed with great positiveness, "There ain't no such animal." And so I will not be surprised if many of you decide in your own minds that "There ain't no such gas company" as the one I have created for the purposes of illustration.

I can assure you, however, that in general the data corresponds to the average small isolated gas plant and system manufacturing its own gas, and with the consideration of some of these figures, we may be led to some important conclusions necessarily involved in the equitable determination of reasonable gas rates. The following data include the important facts pertaining to the gas plant and system used for the purposes of illustration:

Population served	12,000
Cost of oil, per barrel	$0.80
Cost of oil, per year	$14,300
Installed capacity of gas plant, per day, cubic feet	410,000
Installed capacity of gas plant, per year, cubic feet	150,000,000
Total gas manufactured, as measured by station meter, per year, cubic feet	71,000,000
Cost of oil per 1,000 cubic feet, gas manufactured	$0.205
Gallons of oil used per 1,000 cu. ft. of gas manufactured.	10.65 gals.
Total gas delivered to customers' meters or sold, per year, cubic feet	60,000,000
Cost of oil per 1,000 cubic feet of gas sold	$0.238
Difference between quantity of gas manufactured and sold, cubic feet	11,000,000
Per cent. difference between gas manufactured and gas sold	15.5 pr. ct.
Aggregate length of distribution system or mains in miles.	37.5
Average cost, distribution system or mains per mile, exclusive of services, meters, etc	$3,335
Number of customers	2,800
Number of customers per mile of mains	75
Total valuation of system	$362,500

In the consideration of the economics of electric light and power installations and service, it is quite usual to determine the investment or value of the plant per unit of capacity or per unit of output. While this is done less often in the gas business, it is interesting to contrast the unit investment required in a gas manufacturing plant and system based on the installed capacity, the quantity of gas manufactured and delivered to the holders and the amount of gas delivered to customers' meters.

Table I. gives this information for the plant under consideration, which it is assumed has a total value, including the physical plant and also the value of the company as a going concern, amounting in the aggregate to $362,500. This total is subdivided as indicated, the gas manufacturing plant representing $195,000; the distribution system exclusive of customers' services $125,000; and, finally, customers' services, meters, etc., being $42,500. In this installation the investment per 1,000 cubic feet of the plant capacity is $2.41, while the corresponding investment per 1,000 cubic feet manufactured is $5.11, and per 1,000 cubic feet of gas sold, $6.05.

I have used the word investment in the above statement as synonymous with, and the same as, value, which includes not only the physical plant, or possibly the cost of reproduction new, but also the going value due to the established business of the company.

Table II. sets forth in detail the total annual generating costs and cost of manufacturing per 1,000 cubic feet of gas sold. The different items, which are included in the total annual operating costs of $46,645, include the rate of return of 8 per cent. upon the investment or total value of the plant, the taxes based upon 4 per cent. of the gross receipts in accordance with the California tax law, depreciation only on the depreciable part of the manufacturing plant, not including real estate, for instance, the necessary fuel oil and finally station wages, maintenance, operation and station supplies.

Table III. gives the corresponding figures for the total annual cost of distribution as well as the cost of distribution per 1,000 cubic feet of gas sold and delivered to customers.

Table IV. contains similar items entering into the total annual cost of serving, metering, billing and collecting, which naturally include

office expenses, as well as the cost of these items per 1,000 cubic feet of gas sold.

Table V. is a summary of Tables II., III. and IV., and while there are many valuable points to discuss in each of these three tables, I will only refer to the summary, as indicated in Table V. The total operating expenses, added to the amount necessary to provide a return upon the value of the plant at 8 per cent. per annum, is $84,145 per year. If not more than 60,000,000 cubic feet of gas can be sold in the district, the necessary average price per 1,000 cubic feet of gas sold is practically $1.40.

Do not let it be understood, however, that it is proper to conclude that $1.40 per 1,000 cubic feet is the proper rate, since it may be not only possible, but extremely desirable, both for the benefit of the company as well as its customers, to increase the total gas sales, let us say, about 40 per cent., which wonld make the total annual amount of gas delivered to customers 84,000,000 cubic feet. If this increased consumption could be attained, without materially increasing the investment required, gas could be sold at an average rate of $1 per 1,000 cubic feet resulting in a total annual revenue of $84,000, which is adequate to give the revenue required to provide a proper return upon the value of the plant.

The important point, gentlemen, is this: "What principle should be our guide in the establishment of a gas rate?" Attempt to maintain a rate as high as $1.40 per 1,000 cubic feet, probably thereby reducing the total annual aggregate sales, or make every consistent, reasonable, yes, even possible effort, within the limits of good business policy to increase the sales of gas to as much as 84,000,000 cubic feet per year, and adopt a dollar rate per 1,000 cubic feet. You, gentlemen, are much more capable than anyone else in giving the proper answer to this most vital question.

In order to set forth some additional information in connection with such a gas manufacturing plant, and distribution system, it may be assumed in the various analyses, and perhaps with good reason, that the intangible value or going value of the business has been exaggerated. In this particular instance, the going value has been assumed to be the equivalent of about 10 per cent. of the total value, although in arriving at the going value the actual cost of developing the business has been utilized, and it is merely a coincidence that the going value in the aggregate is equivalent to about 10 per cent. of the total value of the system.

Again, it is possible that the existing value, or the original cost less depreciation to date, to which is added a sum estimated to be equivalent to the value of the going concern, should be used instead of the value of the plant and system based upon the cost of reproduction new, to which is added the going value of the company with its established business.

Table VI. to X. inclusive give the figures based upon the existing value of the gas manufacturing plant and system, which tables should be compared with Tables I. to V. inclusive, which give the figures based upon the total value undepreciated.

Table VI. gives the total existing value, or investment, as $290,000 which, when compared with the former figure of $362,500, would indicate that the total depreciation to date is $72,500.

Table VI. is similar to Table I., and shows the depreciated investment per 1,000 cubic feet of gas installed capacity as $1.93, the investment per 1,000 cubic feet of gas manufactured, $1.09, and the investment per 1,000 cubic feet of gas sold $4.84.

Tables VII., VIII. and IX. show the items and the totals which enter into the generating, distribution and serving, metering, billing and collection costs, and Table IX. gives the summary as well as the total annual revenue required to meet operating expenses and provide an adequate return upon the investment as well as the average rate per 1,000 cubic feet of gas sold.

If the value of the plant as depreciated to date, including the proper estimate of the additional value as a going concern, is $290,000, the total annual revenue necessary is $78,345. If no more than 60,000,000 cubic feet of gas per annum can be sold, the average return is practically $1.31 per 1,000 cubic feet. In other words, if the rate for gas service is based upon the value of the plant new, the selling price of gas would be $1.40, while on the other hand the rate would be $1.31 per 1,000 cubic feet, if the rate for gas service were determined upon the existing or depreciated value of the entire plant.

At this time it may be well to state that, when a public utility company charges off each year a bona fide sum to cover depreciation, then either one of two methods should be followed by such a corporation.

First.—That there be expended, not each year necessarily, but on the average throughout the life of the system, an amount equal to this depreciation fund in order that the plant and system may be maintained in its original or 100 per cent. condition.

Second.—If this is not done by such a public utility company, then the rate of return should not be based upon the cost of reproduction new but in equity upon the existing value which may in general be determined by reducing the original value by the depreciation of the plant and system to date.

Referring to Tables V. and X., an important fact is to be noted:

It would seem that, in certain sections of California, we are soon to be provided with natural gas, so it may not be necessary to artificially manufacture gas as heretofore. I have heard it stated by many very well-meaning laymen that, when this natural gas is available, it can be delivered to the customers of the present gas companies for a very small fraction of its present cost. Let me see what would be the result of delivering gas at no cost whatsoever to this small community of about 12,000 inhabitants, if this natural gas is distributed to customers throughout the present distribution systems.

As set forth in Table V., the total cost of distributing, serving, metering, etc., per 1,000 cubic feet of gas sold is the sum of $.332 and $.293 or $.625.

In Table X. the corresponding cost of distributing, serving, metering, etc., is the sum of $.299 and $.282, or $.581. In other words, assuming that such local gas manufacturing and distributing companies were to receive the natural gas free of any cost whatsoever (which is manifestly absurd as a business proposition) and in addition were not allowed even interest and depreciation upon their present manufacturing plants, because they would probably be idle, the rate for gas service in this community would be about 60 cents per 1,000.

Fig. 1 shows graphically by curves, some interesting facts relating

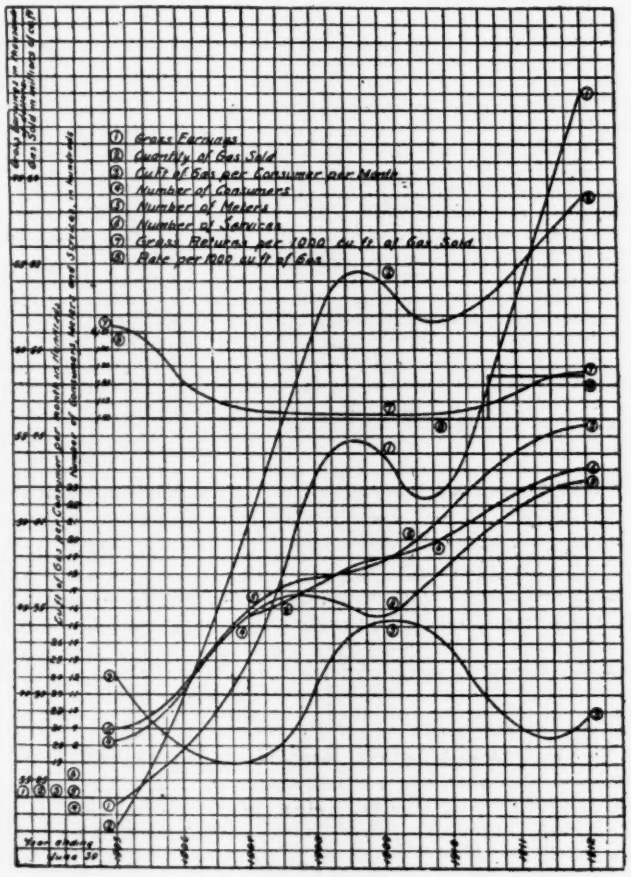
1 Gross Earnings
2 Quantity of Gas Sold
3 Cu. ft. of Gas per Consumer per Month
4 Number of Consumers
5 Number of Meters
6 Number of Services
7 Gross Return per 1000 cu. ft. of Gas Sold
8 Rate per 1000 cu. ft. of Gas

Fig. 1.—Curve Showing Yearly Growth of Earnings and Relevant Data.

to the plant which I have used for the purposes of illustration. From 1905 to 1912, records were available so that these curves could be compiled. The figure includes the following curves:

1. Gross earnings.
2. Quantity of gas sold annually.
3. Cubic feet of gas sold per customer per month.
4. Number of customers.
5. Number of meters.
6. Number of services.
7. Gross return in dollars per 1,000 cubic feet of gas sold.
8. Rate per 1,000 cubic feet of gas delivered to customers.

These curves vividly illustrate some of the points to which reference has been made above.

Some of the risks involved in the gas industry in a small, isolated community were referred to. The effect of the financial panic (the latter part of 1907 and 1908) upon the business of this Company is observable at a glance. The gross earning from 1905 steadily increased until 1908, and there then resulted a general stagnation in the business which continued for more than 2 years. Quite independent of the rate per 1,000 cubic feet of gas sold the quantity delivered to customers suffered a decided reduction.

Curve 3 is of the most vital importance to those interested in the manufacture and sale of gas. Beginning with the latter part of 1906, the consumption of gas per customer began to increase, from 1,900 cubic feet per month, until 3 years later it was 2,700 cubic feet per month, or an increased consumption per month per customer of nearly 50 per cent. When the effect of the financial stringency began seriously to be felt, however, the consumption per customer again decreased, so that even at the same rate or cost per 1,000 cubic feet of gas, the consumption per customer per month was, on December 31, 1910, reduced to 2,300 cubic feet per month per customer. After this date the consumption per month per customer was still further reduced, due possibly to an increase in the rate or cost of gas per 1,000 cubic feet, to 2,000 cubic feet per customer per month on Janu-

ary 1, 1912, since which date there is some indication of improvement. As repeatedly maintained, all efforts to increase the average consumption of gas per customer tends to decrease the price at which gas may be sold; and again, with good service, a decrease in the price at which gas may be sold acts as a stimulant to increase the sales, not only in the gross but in the consumption per customer as well.

The development of industrial business or the consumption of gas in large quantities, if such be possible in the community, and the introduction of new and economical gas appliances for domestic purposes, are both very effective in increasing the amount of gas used per service or per customer.

Curves 4, 5 and 6 show what happens during financial depressions, either local or general, in rendering many services and meters idle. June 30, 1907, there was very little difference in the number of services, meters and consumers respectively, but two years later there were many idle services and meters, which again is not a good business situation for the gas company.

Curves 7 and 8 indicate the average gross return per 1,000 cubic feet of gas sold, and the rate in force at the particular time respectively.

A study of a small gas manufacturing and distributing plant such as the one under consideration indicates what is well known and extensively practised on the Pacific Coast, namely, the increased economy and better service resulting from a large gas generating plant, from which is distributed at high pressure the gas used in a number of small communities. The fixed charges in the manufacture of gas bear such an important relation to the costs of manufacture that increasing the amount of gas made in a single plant very materially reduces the cost of the gas delivered to the holder.

Finally, it is evident that it may not be best for a small gas company in analyzing the situation, somewhat as above indicated, to conclude that it is desirable to maintain a rate for gas of $1.30 or $1.40 per 1,000 cubic feet of gas sold. Much better would it be to make every effort, which must include the best possible service, to increase the output of the plant and the resultant gas sales, to the end that everybody would be benefited, the company as well as the people of the community. The proper development of a city and its environs will be the more fully realized if from a given gas manufacturing plant and system, 90,000,000 cubic feet of gas may be sold at an average rate of $1 per 1,000 instead of 60,000,000 cubic feet of gas being sold at a 50 per cent. greater rate, or $1.50 per 1,000. The required increase in investment, even if such is necessary, will not be in proportion to the increased sales, and good service and cheaper gas, with the rapid advances being made in domestic gas appliances, can only result in a reasonably prosperous community, in a permanent increase, not only in the total gas sales, but also in the amount of gas delivered to each customer during any given period.

[The addenda to this paper is too valuable to give as a summary; hence the figures are held over to be reported in full next Monday.—Eds.]

New Methods and Appliances.

Improvement in Pipe Laying Apparatus.—The experiments made by Mr. L. H. Johnson, Master Mechanic and Superintendent of Gas Plants, Western Gas and Electric Company, Aurora, Ills., with a new style of pipe wrench have shown results that must be of great interest to the gas industry. Mr. Johnson tried the wrenches out on a 4-inch pipe line that he was laying from Aurora to Oswego, and on a 8-inch pipe line from Joliet to Lyle. His reports from the various foremen were as follows:

Mr. Krauss, foreman on the Oswego line, states that the work was done better and quicker, and that the factor of leakage (which is caused by not having pipes screwed up tight enough) was considerably lessened. The reason for this is that, when using ordinary chain wrenches, they cannot screw up tight enough, because there is always danger of crimping or splitting the pipe, for the jaws have to sink into the pipe in order to get a grip. In this way, a length of pipe is often ruined, for it has to be taken apart and thrown away, causing a loss in cost of pipe and wasted energy and labor and troubles on the part of the foreman on the job. Foreman Krauss states that one of the best points of the new wrench is the men thought so much of it because it was so much easier to handle and work than with the chain tongs. The entire Oswego line—a stretch of about 5 miles—was laid with only one wrench outfit.

On the Joliet line (a distance of 18 miles) they used only two outfits. Mr. H. Schick, foreman-on-the-line, announces a day's work which he considers a record On August 31st, 1912 (one of the hottest days of the summer), he laid 105 lengths of 8 inch pipe in 9 hours and 10 minutes, when ordinarily with a like number of men working, he laid about 1,000 feet per day; 105 lengths, of course, stands for about 2,100 feet. There was neither a split nor crushed pipe on either line. An important feature of the wrench is it in no way damaged the pitch that was the covering on these pipes. The repairs on the wrench were so small as to be negligible.

The great importance of this new wrench to the gas industry lies in the fact that it permits the use of threaded pipe where, owing to the disadvantages contingent upon the use of chain wrenches, flanged pipe is now used. The manufacturers of the wrench claim these reasons for its success: It grips the pipe with equal pressure all the way round; that it cannot slip or lose its grip even when taking a new hold. The wrench is manufactured by the Parmelee Wrench Company.

Items of Interest
FROM VARIOUS LOCALITIES.

The Citizens Gas and Fuel Company, Terre Haute, Ind., has awarded a contract for its new purifying equipment to the Gas Machinery Company, of Cleveland, O. The new equipment and apparatus will be quite like that installed by the Gas Machinery Company a few years ago. It includes duplex cast iron purifiers, with oxide elevator, with, of course, the necessary valves and connections.

Mr. William J. Barker, the clever General Superintendent of the Denver (Col.) Gas and Electric Light Company, has been asked by Mr. Henry L. Doherty, to assume the duties of consulting expert for the various electric enterprises embraced in the Utilities Improvement Company, the formation of which was perfected in mid-October. In the new Company's properties are electric plants located in Connecticut, Ohio, Oklahoma, Kansas, Missouri, Georgia and Canada.

Dr. Bemis, who was instructed ever so long ago to get together information respecting the proper cost for telephone service in the city of Chicago, was recently well-jacked up by the Committee having the matter in charge. In fact, Chairman Cernak, one evening not long ago, was so exasperated over the delay, declared, in response to the Doctor's excuse as to why the report was not in hand: "Write a letter or call up by telephone. Don't come in here again unless you have that report ready by Friday." The Aldermanic sub-committee having certain lighting matters in charge in Chicago, seems to have resided once on the East Side of New York, in the vicinity of the Passover bridge, judging so from their names: Walkowick, Sitts and Block.

"Peff." declares the demand for Clark Jewel Company specialties, such as "Retort Gas Heaters," "Radiators," of the "Ebony Black Steel top and base, with Blue Steel Tubes," "Nickeled Trimmings," "Mica Windows," "Glass Jewels"—as if any purchaser "ever could think" these jewels were of the Tiffany collection—etc., are selling into the hundreds. Of course, "Peff." never overstates anything, so the actual selling score must be up in the 1,000's. Well, let us hope so.

We are informed that the generating plant of the Woodall Duckham type, recently installed in the works of the Derby (Conn.) Gas Company, is going along smoothly. Possibly the Derby folks can be prevailed upon by Secretary N. W. Gifford to prepare for the 1913 meeting of the New England Gas Association a paper detailing some of the working results of the plant in question.

Mr. L. Gaston has been appointed Commercial Business and Advertising Manager of the Knoxville (Tenn.) Gas Company.

Mr. Thomas Airy, formerly Superintendent of the Flemington (N. J.) Gas Company, from which service he resigned some months ago, died quite suddenly, in a passenger car of the Central Railroad of New Jersey, the night of October 23d. He was returning to Flemington from a visit to Plainfield, N. J. He was in his 34th year.

"V. F. T.," writing from Bridgeport, Conn., incloses the following from a recent issue of the Bridgeport *Leader:* "One L. J. Korb is suing the Bridgeport Gas Company for $20,000. He alleges the responsibility of the Company for the deaths of 4 people by asphyxiation in Bridgeport, Oct. 29, 1911. He sues for $5,000 damages in respect of each death, and he is acting as administrator of the estates of those concerned. The Gas Company took out a meter from the ground floor of the tenement, of which the Harcharick's occupied the second floor. The writ alleges the Company forgot to turn off the gas at the main and that a small stopcock was left in such shape that it was turned on when the Harchariks opened a door leading to the rooms, and that the fumes ascending from the lower floor killed the 4 people. The Gas Company set up a general denial."

Some days ago representatives of many New Jersey Gas Companies met in Trenton to discuss with Commissioner Daniels, of the State Board of Public Utility Commissioners, with the purpose of formulating a uniform system of accounting and bookkeeping. A proposed plan had been framed by the State Board, the main features of which were quite like those of the system adopted by the Public Service Commissions of New York, and the inter-State Commission. Certain changes were embodied in the tentative plans, following a plan that was recommended at an earlier hearing before the Utilities Commis-

sion. Some of the representatives urged that the proposed gas system would be bettered were it amended in a number of particulars; but the sentiment of the session undoubtedly favored generally the plan proposed. It was, at the close of the sessions, understood that consideration would be given by the State Board to the suggestions then offered, and an order promulgating the new system was issued last week, with the further understanding that the change would become effective as of January 1, 1913.

THE Casper-Runyer Construction Company, of which concern we have no further knowledge than this, is said to have been awarded a contract for the construction of a new gas plant in Amherst, Mass., It is estimated that the cost thereof will be $45,000.

"B. M. B.," incloses the following, from the Fresno (Cal.) *Republican*, of date of the 18th ult.: "Mr. Charles S. Forney, President of the Central California Gas Company, arrived in Porterville, Cal., this week, right from San Francisco, in which city he had been conferring with the bankers who are financing the Porterville proposition. Mr. Forney stated that orders had been placed with Eastern foundries for a 40-car trainload of pipe to be used in extending the system through Visalia, Tulare, Exeter, Lindsay and Strathmore. Work will be started on this system of betterments as soon as the material arrives."

ADVICES dated "Natick, Mass., October 23d," are to the effect that the Massachusetts Board of Gas and Electric Light Commissioners that day had rendered a decision in respect of a petition made some months ago that a reduction in the gas selling rate be ordered. The Commission decides that the current rate ($1.65) shall be reduced to $1.50 per 1,000, on or before December 1st.

MR. EDWARD B. PASSAMO will lecture on "Measuring Efficiency in Manufacturing," at a stated meeting of the American Society of Mechanical Engineers, to be held in the Society's headquarters, 29 West 39th street, New York, at 8:15, the evening of the 12th inst.

ON the afternoon of the 25th ult., the Massachusetts Board of Gas and Electric Commissioners issued an order determining and declaring that hereafter the rate for arc lamps (in the Malden District) burning all night and every night in the year, shall not exceed $85 each per year. The prevailing rate for such service is $96 per lamp per year.

THE following are the prices at which the public lighting of New Bedford, Mass., shall be performed by the New Bedford Gas and Electric Light Company, for and during the next period of 5 years:

1. Arc (electric) lamps, not less than 500, of the type commonly known and described as enclosed arcs, of 375 volts, $80 each per year.

2. For incandescent street lights, each per year: 75-volt tungstens, $20; 100-volt tungstens, $27; 125-volt tungstens, $34; 250-volt tungstens, $68. No figure was given for any light of less than 75 volts, the Company asserting that such unit is as small a one as can be employed to furnish satisfactory street lighting; and at the reduced price it was considered that the city would be better satisfied to take the larger volume of light offered for a price lower than formerly charged for the smaller unit lamp.

3. For gas light, rates to be: 60 candle-power Welsbach, gas street lights, similar to those now in use, $27.60 each per year; for 150-candle-power, double Welsbach gas street lamps, $40 each per year; for the street, ornamental post lamps, such as are installed around the High School building, $77.90 per year per post. These prices are based on a minimum number of gas street lights fixed at 150, which counts as one light, one post, without reference to the kinds or number of lights installed upon the post.

4. For naphtha lighting: The 60-candle power, self-generating, Welsbach street light, such as those now in use, $31 per year, each. Under the old (or present) contract the rates obtaining are:

	Old.	New.
Arc	$97.50	$80.00
Incandescent	25.50	20.00
Gas	28.50	27.00
Naphtha	31.50	31.00

It should be further said, in connection with these figures, that the old contract provides for a reduction in the price per lamp, for arcs, if the number were increased, from that specified at the commencement of the contract. Under this clause electric arcs are being billed at the rate of $92 each per annum, so that the reduction in the new scheduling is tantamount to $12 per lamp per annum.

SOME days ago the creditors of the Americus (Ga.) Gas and Electric Company took over the properties of the named corporation. Under this call the National Park Bank, and the Guarantee Trust Company are in control of the plants. Undoubtedly the concern will be reorganized.

IT seems well-authenticated that the Solvay Process Company, of Syracuse, N. Y., is about to take over the plant of the Empire Coke Company, Border City, N. Y. Border City is virtually a suburb of Geneva, N. Y., and it is from this Empire plant that all the gas supplied to the residents of the chain of places known respectively as Seneca Falls, Geneva, Waterloo and Auburn, is manufactured. The sale was to have been made effective the 1st inst., and the real effect of the transfer would seem to be the getting out of the way of a rival coke producing concern by the Solvay people. At this distance it looks that the deal will be as beneficial to the gas users of the places named as it will be of avail to the Solvay Process Company's proprietors.

THE Byllesby Company announces that Mr. R. J. Graf, of Chicago, will be appointed Secretary of the Louisville (Ky.) Gas Company and of the Louisville Lighting Company, with headquarters in Chicago. Mr. F. A. Nobbe, Secretary and Treasurer of the Gas and Lighting Companies, and Mr. T. B. Wilson, former Secretary of the Lighting Company, will each become Assistant Secretaries of both, with headquarters in Louisville. Mr. M. A. Morrison, of Chicago, is to be Assistant Secretary of both Companies, and the meetings of each will hereafter be held in Chicago. Alack and Alas! And think of that essentially home corporation of one time, in the days of the dynasty of the Barrets (father and son), that prince of Southern financiers, "Harry" Bishop, the smooth-tongued Geo. W. Morris, and the rest! However, "*Tempora mutantur.*"

LAST week the proprietors of the Suffolk (Long Island) Gas and Electric Company petitioned the Public Service Commission, Second New York District, for consent to issue $150,000 first mortgage 5's, refunding, bonds. The Company proposes to market the bonds at 87 or over, and to expend the proceeds for the improvement and extension of its generating and distributing plant and system in Bay Shore, and for the construction of the gas mains necessary to connect the Bay Shore plant with the main system of the South Shore Gas Company at Babylon, N. Y. It is also proposed to construct main lines to the villages of Sayville and Bayport. The named places are all on the South Side, and from their former standing as summer resorts and localities abounding in the country homes of many wealthy families, are now really fast becoming urban settlements of Greater New York.

"WHILE John J. Sullivan was never very high in position on the working force of the New Bedford (Mass.) Gas and Edison Light Company, it is nevertheless a fact that his duties in connection with the position that he did hold were performed faithfully and well. This by way of preface to inform you briefly that his death occurred in this city, at his residence, 165 Ashland street, the morning of the 20th of last month. The funeral services were held in St. Mary's Church, the morning of the 23d, and the remains were interred in St. Mary's Cemetery. These lines are penned by one who, having long worked with him, well knew his real worth.—P. M. M."

THE Fall River (Mass.) Electric Light Company is offering to light that city, on public account, in so far as arc electric lighting of the streets is concerned, at the rate of $80.30 per arc per annum, on an all night and every night schedule. If any arcs are carried on ornamental poles, the rate for such lamps is to be $91.25 each. In passing it might be noted that this offering ('tis based on a 5-year contract) is $10.90 lower per lamp per annum than the present rate; further, that it is in accord with the prevailing rate at Worcester, Mass., which rate was determined after a hearing before the Board of Gas and Electric Light Commissioners.

Recent Patent Issues.

Prepared for the AMERICAN GAS LIGHT JOURNAL by ROYAL E. BURNHAM, solicitor of patents and counselor in patent causes, 833 Bond Building, Washington, D. C., from whom illustrations and specifications of any patent mentioned below may be obtained for 20 cents.

1,041,038. Device for Lighting and Extinguishing Gas Flames from a Distant Point. G. Dalen, Stockholm, Sweden, assignor to Aktieqolaget Gas Accumulator, same place.

1,041,058. Method of Making Hot Producer Gas. E. Fleischer, Dresden-Alstadt, Germany.

1,041,082. Plant for the Continuous Distillation of Coal Tar, Mineral Oils, and the Like. H. P. Hird, Norwood Green, England.

1,041,156. Method of Ascertaining the Location of Leaks in Underground Fluid Pressure Pipes. G. V. Payne, Chicago, Ills.

1,041,283. Combined Gas Generator and Burner. E. E. Hickerson, McComb, O.

1,041,553. Gas Heater. P. F. Woldan, Brooklyn, N. Y.

The Market for Gas Securities.

That the "earnings" of the Consolidated Gas Company are still insufficient to pay a quarterly dividend in excess of 1¼ per cent.—the stipulated dividend that may be returned to its shareholders under the ruling of the United States Supreme Court—seems the opinion of the Directors, for yesterday that return (1¼ per cent.) was declared—yesterday standing for the 31st ult. Dear old Irving Place will rise in its might some day and change that rate, possibly when some of its highest financial controllers are obliged to exclaim, "Our vaults are filled to overflowing." It opened to-day at 143½ to 143¾—not even the dividend was added to the bid price of a week ago.

Brooklyn Union is 144 bid, and quite some inquiry was made last week for B. U. 5's. Peoples, of Chicago, is 118½ to 118¾. It does not admit of doubt that some of the cleverest investors in Chicago and Pittsburgh are "putting" these shares away for keeps. Laclede's show no change. The bond market continues good. Among the dividends payable to-day are these: American Light and Traction, preferred, 1½; common, 2½; stock, 2½; Fall River (Mass.), gas, 3; Massachusetts gas common, 1; preferred, semi-annual, 2; Mexican Light and Power, semi-annual, preferred, 3½; Portland (Ore.) Gas and Coke (quarterly), 1¾; Rio de Janeiro, Traction, Light and Power (quarterly), 1½ Pacific Light and Power, preferred (quarterly) 1¾.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

115 BROADWAY, NEW YORK CITY.

NOVEMBER 4.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share:

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked*
Consolidated Gas Co.	$73,177,000	100	143¾	143⅞
Central Union Gas Co.—1st 5's, due 1972, J. & J.	8,000,000	1,000	103	105
Equitable Gas Light Co.—Con. 5's, due 1932, M. & S.	1,000,000	1,000	105	106
Mutual Gas Co.	8,500,000	100	182	187
New Amsterdam Gas Co.—1st Con. 5's, due 1948, J. & J.	11,000,000	1,000	101	102¼
New York & Richmond Gas Co. (Staten Island)	1,500,000	100	35	50
1st Mtg. Gold Bds. 5 p. ct.	1,500,000	—	98½	100½
New York and East River—1st 5's, due 1944, J. & J.	8,500,000	1,000	103	105
Con. 5's, due 1945, J. & J.	1,500,000	—	95	100
Northern Union—1st 5's, due 1927, J. & J.	1,250,000	1,000	99¼	101
Standard	5,000,000	100	60	70
Preferred	5,000,000	100	90	100
1st Mtg. 5's, due 1930, M. & N.	1,500,000	1,000	103	105
The Brooklyn Union	15,000,000	1,000	144	145
1st Con. 5's, due 1948, M. & N.	15,000,000	—	105¾	107
Yonkers	299,650	509	130	—
Out-of-Town Companies.				
Bay State	50,000,000	50	⅜	½
" Income Bonds	2,000,000	1,000	—	75
Binghampton Gas Works	450,000	100	—	—
" 1st Mtg. 5's	500,000	1,000	97	100
Boston United Gas Co.—1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	5	8
Bonds, 5's	5,250,000	1,000	59	60
Capital, Sacramento	500,000	50	—	35
Bonds (6's)	150,000	1,000	—	—
Chicago Gas Co. Guaranteed Gold Bonds	7,680,000	1,000	104	106¼
Cincinnati Gas and Electric Co.	20,500,000	100	87	90
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	96	98
Columbus (O.) Gas Lt. & Heating Co.	1,682,750	100	90½	91
Preferred	3,026,500	100	75¼	80
Consumers, Toronto	2,000,000	50	200	204
Consolidated, Baltimore	13,460,084	—		—
Mortgages, 5's	3,400,000	—		—
General Mortgage 4½	10,661,000	—		—
Con. Gas Co., Baltimore City, 4½	2,751,000	—		—
Consolidated Gas Co. of N. J.	1,000,000	100	15	—
Con. Mtg. 5's	976,000	1,000	94	96
Bonds	75,000	—	—	100
Essex and Hudson Gas Co.	6,500,000	—	133	136
Fort Wayne	2,000,000	—	—	—
" Bonds	2,000,000	—	55	—
Grand Rapids Gas Light Co., 1st Mtg. 5's	1,350,000	1,000	100	101
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	—	130	133
" Bonds, 5's	10,500,000	—	104	106
Indianapolis	2,000,000	—	38	45
" Bonds, 5's	2,650,000	—	104½	105
Jackson Gas Co.	250,000	50	82	—
" 1st Mtg. 5's	290,000	1,000	91	95
Kansas City Gas Light Co., of Missouri	5,000,000	100	—	86
Bonds, 1st 5's	3,822,000	1,000	98½	99
Laclede Gas Co., St. Louis	10,000,000	100	105¼	105½
Preferred	2,500,006	100	99	102
Bonds	10,000,000	1,000	102¾	103
Lafayette Gas Co., Ind.	1,000,000	100	—	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	120	130
Madison Gas and Electric Co. " 1st Mtg. 6's	400,000	1,000	105	
Massachusetts Gas Companies, of Boston	25,000,000	100	93	93¼
Preferred	25,000,000	100	96	96½
Montreal Gas Co., Canada	2,000,000	100	236	238
Nashville Gas Light Co.	1,000,000	100	110	—
Newark, N. J., Con. Gas Co.	6,000,000	—	97	98
Bonds, 6's	6,000,000	—	127	128
New Haven Gas Co.	5,000,000	25	182	190
Peoples Gas Lt. & Coke Co., Chicago	25,000,000	100	118¼	118½
1st Mortgage	20,100,000	1,000	102	102½
2d "	2,500,000	1,000	104	—
Rochester Gas & Electric Co.	2,150,000	50	88	—
Preferred	2,150,000	50	118	—
Consolidated 5's	2,000,000	—	104¾	105½
Pacific Gas and Electric Co.	15,500,000	—	65½	66
St. Joseph Gas Co.—1st Mtg. 5's	1,000,000	1,000	96	98
St. Paul Gas Light Co.	2,500,000	100	—	—
1st Mortgages, 6's	650,000	1,000	104	105
Extension, 6's	600,000	1,000	112½	115
General Mortgage, 5's	3,447,000	1,000	94	96
Syracuse Gas Co., N. Y.	1,975,000	100	50	55
Bonds	2,047,000	1,000	101	103
Washington (D. C.) Gas Co.	1,600,000	200	420	425
1st Mortgage, 6's	600,000	—	—	—
Western Gas Co., Milwaukee	4,000,000	—	—	—
Wilmington (Del.) Gas Co.	600,000	50	—	—

MEETING TIMES OF THE VARIOUS GAS ASSOCIATIONS.

American Gas Institute.—Annual meeting, October——— 1913. Officers: President, W. R. Addicks, New York City. Secretary, Geo. G. Ramsdell, 29 West 39th st., N. Y. City.

Canadian Gas Association.—Annual meeting Sept. 1913. Officers: President, Arthur Hewitt, Toronto, Ont.; Secretary and Treasurer, John Keillor, Hamilton, Ont.

Empire State Gas and Electric Association.—Annual meeting, New York City, Oct.—1913. Officers: President, C. G. M. Thomas, Long Island City, N. Y.; Secretary, C. H. B. Chapin, 29 W. 39th street. New York City.

Gas Meters.—Meetings, New York, Nov. 7; Philadelphia, Nov. 14. Chairman, Will W. Barnes; Commissioners, W. H. Pettes, I. W. Petty; Secretary, H. Thurston Owens, 42 Pine street, New York City.

Guild of Gas Managers of New England.—Annual meeting, March, 1913. Young's Hotel, Boston; monthly meeting, second Saturday. Officers: President, Walter G. Africa, Manchester, N. H.; Secretary, H. K. Morrison, Brockton, Mass.

Illinois Gas Association.—Annual meeting, March 19th and 20th, 1913. Chicago, Ills. Officers: President, H. O. Channon, Quincy, Ills.; Secretary-Treasurer, Horace H. Clark, 115 No. Oak Park avenue, Oak Park, Ills.

Illuminating Engineering Society.—Annual meeting,——— September, 1913. Meetings of Sections, monthly. Pres., V. R. Lansingh, Cleveland, O.; Sec., Preston S. Millar, 29 W. 39th street, New York City. Sections: New York, Secretary, C. L. Law, 124 West 42d street. New England, Secretary, H. C. Jones, 10 High street, Boston, Mass. Philadelphia, Secretary, L. B. Eichengreen, Broad and Arch streets. Chicago, Secretary, J. B. Jackson, 28 North Market street. Pittsburgh, Secretary, J. C. Mundo, Oliver Building.

Indiana Gas Association.—Annual meeting, March 12 and 13, 1913. Indianapolis. Officers: President, Howard L. Olds, Indianapolis; Vice-President, Wm. Wallace, Lafayette; Secretary-Treasurer, Philmer Eves, Indianapolis.

Iowa District Gas Association.—Annual meeting, Burlington, Ia., May 22, 23, 24, 1913; Officers: President, C. W. Fair, Atlantic, Ia.; Secretary, G. I. Vincent, Des Moines, Ia.

Kansas Gas, Water and Electric Light Association.—Annual meeting, October——1913. ——— Officers: President, L. O. Ripley, Emporia, Kas.; Secretary and Treasurer, W. H. Fellows, Leavenworth, Kas.

Michigan Gas Association.—Annual meeting, September——1913; ——— Officers: President, W. S. Blauvelt, Detroit, Mich; Secretary-Treasurer, Glenn R. Chamberlain, Grand Rapids, Mich.

Missouri Electric Light, Gas, Water Works and Street Railway Association.—Annual meeting, April, 1913; Joplin, Mo. Officers: President, P. A. Bertrand, Joplin, Mo.; Secretary and Treasurer, P. W. Markham, Brookfield, Mo.

National Commercial Gas Association.—Annual meeting and Gas Show, Dec. 2-5, 1912. Atlanta, Ga. Officers: President, C. L. Holman, St. Louis, Mo.; Secretary, Louis Stotz, 29 West 39th street, New York City.

Natural Gas Association.—Annual meeting, Cleveland, O., May, 1913; Officers: President, M. B. Daly, Cleveland, O; Secretary, T. C. Jones, Delaware, O.

New England Gas Association.—Annual meeting, February,———1913 Boston. Officers: President, D. D. Barnum, Worcester, Mass.; Secretary-Treasurer, N. W. Gifford, East Boston, Mass.

New Jersey State Gas Association.—Winter Meeting, December 18, Newark N. J.—President, William H. Pettes, Newark, N. J.; Secretary-Treasurer, Arthur H. Osborn Belmar, N. J.

Ohio Gas Association.—Annual meeting, February ———, 1913, Columbus, O.; President, John M. Garard, Columbus, O.; Secretary, I. B. Denning, Columbus, O.

Oklahoma Gas, Electric and Railway Association.—Annual meeting, May, 1913. President, Noel R. Gascho, Alva, Okla.; Secretary, H. V. Bozell, Norman, Okla.

Pacific Coast Gas Association.—Annual meeting, San Jose, Cal., September 16, 17, 18 1913. Officers: President, Henry E. Adams, Stockton, Cal.; Secretary-Treasurer, Henry B. Swick, 445 Sutter street, San Francisco, Cal.

Pennsylvania Gas Association.—Annual meeting, York, Pa., April, 1913; Officers, President, H. H. Ganser, Norristown, Pa.; Secretary-Treasurer, W. O. Lamson, Jr., West Chester, Pa.

Society of Gas Lighting.—Annual meeting Dec., 13, 1912; monthly meetings, second Thursday. Place, New York City. Officers: President, Fred. S. Benson; Secretary, George G. Ramsdell, 29 West 39th street, New York city

Southern Gas Association.—Annual meeting, Charlotte, N. C., April———1913, Officers: President, C. E. White, Montgomery, Ala.; Secretary-Treasurer, E. D. Brewer, Atlanta, Ga.

Southwestern Electrical and Gas Association.—Annual meeting, April———1913, Galveston, Tex. Officers: President, F. M. Lege, Jr., Galveston, Tex.; Secretary H. S. Cooper, 405 Slaughter Bldg., Dallas, Tex.

Wisconsin Gas Association.—Annual meeting, May ——— 1913, Milwaukee, Wis. Officers: President, I. F. Wortendyke, Janesville, Wis.; Secretary-Treasurer, Henry Harmon, Milwaukee, Wis.